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A Call for Optimism.

READERS of this journal do not need to be reminded that again and again we have deprecated the disposition of British writers and orators to magnify our shortcomings and thus spread about the world the stupid idea that as an industrial and financial people we are "down and out."

Several years ago a president of the Federation of British Industries came back from a visit to the U.S.A. and warned us that great harm was being done by our excessive introspection and our readiness to accept other people's judgment of our action or inaction. That gentleman is a member of the Education for Salesmanship Committee, whose interim report was reviewed in our last issue. A few days ago the Federation issued a weekly letter to the Press pleading for more optimism and condemning the willingness of our people to stress our failures and to broadcast criticisms of the inefficiency or lack of initiative of our manufacturers. Though we are emerging with "a very reasonable show of success from a long and bitter struggle with trade depression," we "bemoan the fact that we are losing ground in our export markets and blame our salesmen. We advertise the number of our unemployed and draw dismal deductions from their total." Contrasting this attitude with that of others, the Federation finds U.S. experts indulging, in the time of American trouble, in "a doubling of her export of optimistic propaganda."

America is stated to be making a great drive for a "prosperity offensive," and her experts predict new production records next spring. Not all the reports that reach us, however, are quite so convincing on that matter, but we join with the Federation in its appeal to British observers to make the most of our causes of optimism. We have had great economic difficulties in our path and cannot do other than remember them and contrast them with the easier situation in the States prior to the slump. We have also to remember that the British temperament has its drawbacks—if we belittle

ourselves what wonder if overseas customers accept us at our own valuation? Business men resident in the Dominions have asked the Federation to draw the British public's attention to the very real injury that is done to our interests overseas by the dissemination of news calculated to give a gloomy picture of the state of the Mother Country. Parenthetically, may we remark that the world is also too ready to accept American interests at their own valuation. It might help matters to some extent if some of our experts were to investigate and write frankly regarding the industrial failings that are to be met with in America.

There are very definite signs that the future of the British electrical industry is likely to be very great indeed. Export trade figures at this moment are showing that outside of this country we are not by any means "down and out" electrically. Certainly British electrical manufacturers are not blindfold—they can see what is going on and they know their business. But we have a surplus electrical manufacturing capacity in these islands and could produce vastly more than we are doing at present. Increase the Home demand on our factories, and we shall produce more cheaply and expeditiously, and so become still better able to impress the overseas buyer.

Of course there must be a reasonable limit to our optimism; it is not entirely justifiable unless it is based upon facts and upon reliable signs. Whether we speak electrically or generally can we be expected to be overflowing with optimism if we have to keep one eye on our legislators at Westminster, are constantly in fear of new financial burdens, and are noting weekly increases in our unemployment figures?

The valuable publication issued by the B.E.A.M.A. and summarised in our last two issues contains a mingling of optimism and pessimism. In some of its parts it should promote joy in the heart of the young electrical engineer to know that he is connected with an industry which has so glorious a future. It tells of the approach of the time when our basic industries will be able to go ahead and make up the leeway in the electrification of their works and factories, but it looks some distance before it sees railway electrification and rural electrification yielding much business.

While describing Europe as the world's best market for electrical manufactures to-day, it tells us that America and Germany have demonstrated their ability to secure increased foreign trade there in telegraph apparatus and some other lines of the small mass-production classes, because they are outside the particular aptness and interests of the British manufacturer. Let us, however, not be too resigned to the continuance of such a state of things. America is also stated to be winning trade in Europe because of financial penetration and the ownership of subsidiary organisations. Here we may not find ground for excessive cheerfulness, but the effect of foreign capital investment has various ways of working out. Further, we have a great Empire with vast resources, and sooner or later great opportunities for electrical trade, a thought which should at least check our pessimism. On the other hand, we hardly think that the F.B.I. would have us fall upon each other's necks over the Australian tariff question and the dispatch of another Australian Trade Minister to these shores to induce our manufacturers to build works in Australia instead of exporting the products of our workpeople in home factories.

The B.E.A.M.A. book, after gladdening our hearts by reporting the fact that we have regained our strong competitive position, leads us, as we stated last week, into a future where there is "doubt tinged with a kind of desperate optimism." It tells us, as has been already recognised, that the reparations policy of payments in kind has operated against our industry, a thought which recalls the fact that such a disastrous policy was not permitted directly to affect the electrical industry of this country when it was proposed, some years ago, that super-power stations and electric railways for Britain should be provided by Germany direct. What we have endured is bad enough, but is it not small compared with what we then escaped? Any Government having, or affecting to have, the increase of British productive employment at heart will favour the continuance of the policy so far carried out by the Central Electricity Board of securing British power station and other electrification contracts to British factories and British workpeople. How could it consistently do otherwise? Whereat the temperature of our optimism rises considerably, though we still have to keep an eye towards Westminster.

Engineering and Financial Statistics.

Towards the end of last week the Electricity Commissioners issued a new volume of their admirable publication entitled "Return of Engineering and Financial Statistics relating to Authorised Undertakings in Great Britain" (Stationery Office, 12s. net). The present publication relates to the year ended December 31st, 1927, as regards companies, and March 31st, 1928, as regards municipalities, the previous volume (1926-27) was completed so recently as last June, and, as the collating and analysing of statistics on so large a scale clearly involves a large amount of work, the issue of the new edition in a comparatively short space of time appears to indicate that the staff of the Commissioners is free from much of the work involved in the preparation of schemes for the Central Electricity Board and is now able to devote its attention to the more normal requirements of the electricity supply industry. We have on previous occasions commented upon the depreciation in value of these returns consequent upon their late appearance and hope that the noticeable improvement made lately will continue, as even the present volume is surely quite twelve months overdue.

We have suggested recently that the scope of these returns should be extended to cover an analysis of the consumption of electricity in the areas of the different undertakings, in such a manner as to indicate the state of development among different classes of consumers consequent upon the adoption of tariffs with low secondary charges and adequate hire or hire-purchase schemes. Valuable to the whole electrical industry as such particulars would be, however, we think it would be still more desirable to concentrate attention for the time being on the publication of figures on existing lines as soon as possible after the end of the year to which they relate.

As to the contents of the volume before us, we find that during the year under review the number of kWh sold increased by 19 per cent. to approximately seven millions, representing a consumption of 158 kWh per head of the then estimated population, with a maximum demand and connected load per head of 85 and 203 watts, respectively. It must be remembered, however, that the previous year had been one of depression due to industrial trouble and that much of the magnitude of the increase is due to recovery from abnormal conditions. Of the output by authorised undertakings, 64.3 per cent. was sold for power, 24.9 per cent. for lighting and domestic purposes, 9.2 per cent. for traction, and 1.6 per cent. for public lighting.

Approximately two-thirds of the output from 490 power stations was provided by public authorities and one-third by companies. The capital expenditure amounted to some £269,000,000 (£6 per head of population), being £51 per kW of generating plant installed. Of that expenditure 41.4 per cent. was on account of generation and 58.6 per cent. on account of transmission, distribution, &c. Capital expenditure during the year amounted to £30,000,000, or 13 per cent. more than in 1926-27. The total revenue amounted to £53,000,000 (an increase of 6 per cent.) and averaged £18 per £100 of capital expenditure, excluding inter-sales of electricity in bulk. That revenue was equivalent to 1.49d. per kWh sold, as against 1.71d. for the previous year.

Working expenses (including bulk supplies purchased) absorbed 56 per cent. of the revenue, compared with 66 per cent. in 1926-27. The cost of generation accounted for 39 per cent. of the total figure.

These figures are distinctly better than those of the previous year, but—as stated above—much of the difference is accounted for by the industrial troubles of 1926. Nevertheless 1926, in spite of such adverse factors, was itself better than any previous year.

Allocation of Costs of Production.

Two important regulations made by the Electricity Commissioners under the 1926 Act are noted elsewhere in this issue. They relate to the allocation of the cost of production at selected stations and its adjustment according to power factor. The correct allocation of costs to fixed and running components is one of the most important factors in determining the financial balance between the Central Electricity Board and the owners of selected stations, and to devise formulæ for general application is a work involving considerable technical skill and knowledge of operating factors. So far as we have been able to check the figures, they appear to meet, within reasonable limits, conditions that are likely to arise in practice, and it is undoubtedly a distinct gain to have a standard method of ascertaining easily what the proportions of fixed and running costs will be in any given case.

The Radio Manufacturers.

THE annual dinner of the Radio Manufacturers' Association was held on Wednesday last week; on the following day the annual meeting took place. The meeting showed a remarkable degree of unanimity, a circumstance which appears to justify the juxtaposition, and order, of the two events.

The principal theme at both functions was, naturally, the recently-concluded agreement with the Marconi Company upon the question of royalties. Mr. F. Kellaway, speaking at the dinner, pointed out that while manufacturers might consider the terms of the licence not altogether satisfactory, they were such as to provide a considerable amount of protection from foreign competition.

At the annual meeting Mr. J. T. Mould, the chairman, stated that the agreement with the Marconi Company represented the minimum obtainable and members were free to negotiate better terms if they could. One or two members were inclined to wonder how individuals could succeed where the Association had failed. Mr. Mould considered that the best terms had been obtained in the short time available, but hinted that the Association was not bound to remain acquiescent.

The raising of the question of "price-cutting," an evil particularly rife in the radio industry, did not bring forth anything very definite. The chairman mentioned, however, that the wholesalers and retailers had together approached the Association with regard to this matter. Can it be that these three bodies hope to secure by negotiation what it was found impossible to effect by direct association?

One of the many interesting points in the annual report is the statement that it is not considered feasible to form a benevolent fund for the radio trade. The E.T.B.I. is to be asked to extend its wings to cover the industry. No doubt the Institution already has many members in the manufacturing and wholesaling branches, but the extension of its activities to the whole of the retailers (who in many cases have no real electrical experience) is a matter for very serious consideration.

Co-operation Between Supply Undertaking and Factory.

IT is often stimulating to diverge from the beaten track, and in this connection we have in mind the electricity supply organisation of the Staveley Coal and Iron Co., Ltd., to which we refer elsewhere in this issue. The undertaking is non-statutory, and, of course, its main purpose is to supply electricity for the various activities of the company; but the supply of something like 20 million units per annum to 7,000 consumers suggests an important public supply undertaking.

The real interest in the Staveley concern, however, from the electricity supply engineer's point of view, lies in the combination of works supply and public supply, together with the fact that practically the whole of the output, 70 million units, is produced by the use of waste heat from what may be described as the manufacturing side of the company. The result is that the undertaking is able to supply electricity, while making a reasonable profit, at the particularly low average figure of 0.55d. per unit. Another feature of the concern which has helped considerably in attaining the above result is the fact that, by using a large proportion of its own load to fill the valleys, it has been able to produce a load curve representing a factor of about 70 per cent.

These figures should, we suggest, be given great consideration by all interested in the electricity supply industry. The ordinary supply undertaking, of course, has no such advantages as those pertaining to the Staveley concern, but could not the principle of co-operation between the two branches of the company, manufacturing and electricity supply, be applied in the broader sense as between the manufacturer and the supply undertaker? The suggestion, we assert, in view of the importance of the Staveley figures, is not one to be turned down as impossible without consideration of its possibilities.

The activities on the manufacturing side of the company in question are very similar to those of numerous concerns throughout the country in which no use whatever is made of waste heat, and the power requirements of the same branch of the company are also very similar to those of numerous manufacturers who run their motors on the peaks of the supply undertakings.

More About Russia.

SOVIET Russia remains an unknown quantity in spite of all that has been written during the past nine years. We have done our best to keep our readers acquainted with the situation of the country as it affects the electrical industry and the article by Dr. Segal which appears in this issue is only the latest of a long series. It is evident from this article that the Soviet Government realises the value of the electrification of industry, for much of the plant now being installed is designed to supply energy to factories and works. The figures given show a remarkable electrical development and prove that economic necessity stimulates rather than retards electrification.

Dr. L. Segal claims that by the end of the current financial year the capacity of electric power stations in Russia will be treble the pre-war figure, while the output of these will be over four-and-a-half times the output in 1913. He also says that the huge sum of £70,000,000 is to be spent on electrical construction in the current financial year; a large proportion of the plant involved must of necessity be imported and therefore the opportunities for electrical manufacturers would appear to be good. We showed in our last issue that the Russian imports of electrical machinery and apparatus in 1927-28 were valued at 46½ million roubles (about £4,650,000) representing an increase of about 90 per cent. on the 1926-27 total. At the same time it was stated that the imports represented only 29.7 per cent. of the total sales, which seems to point to a large home production, aided no doubt by "imported" foreign experts and ideas. Although in 1927-28 Germany's share declined, it was still more than half; this is attributed to a credit of 30 million marks provided by Germany. The participation of Sweden and the United States was also substantial and this may be assumed to be due to a great extent to the above-mentioned technical assistance of which we have made mention on several occasions. America is still pursuing this policy if a recent Moscow message is to be credited. This says that the Russian Trading Delegation in the United States (the "Amtorg") is negotiating with the American General Electric Co. with regard to the delivery of further electrical manufactures. Last year (as we reported at the time) an agreement was entered into between the company and the Soviet Government for the supply of products of the value of $26,000,000. The present negotiations concern the delivery of goods valued at $4,000,000 for electrical works in Siberia. It is also reported that the Soviet authorities have admitted a group of 37 American engineers for work in the power stations in Eastern Siberia.

All these considerations should be borne in mind during the negotiations which are to follow the recent exchange of ambassadors between this country and Russia. There is undoubtedly business to be done if satisfactory terms can be arranged.

Electric Lighting on Small Tugs.

The Case for the Use of Electricity and some Notes on Installation Work.

By A. F. BEACH.

THERE are many important points in connection with the installation of electric lighting on board small steam tugs which are likely to be unforeseen by a contractor who has had no previous experience of this kind of work.

The craft referred to has a cabin at each end, the intervening space being occupied by the boiler and engine, the former taking up practically the whole width.

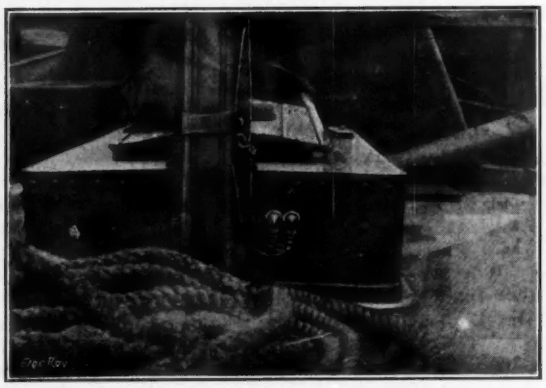


Fig. 1.—Position of Plugs for Mast Light.

Perhaps the greatest advantage gained by the use of electricity for lighting is due to the fact that the top mast light can be switched on and off immediately from the wheel box. It should be explained that a tug shows three lights when under way alone: a white light on the mast, a red light on the port side, and a green one on the starboard side. When towing, two white lights are carried on the mast, one vertically above the other, and not less than four feet apart; the masters of other vessels are then aware that they cannot cross close astern. It will be seen that any delay in showing this extra light, after picking up a tow, may be, and in fact often is, the cause

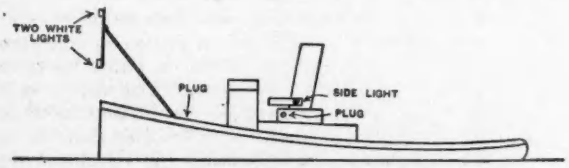


Fig. 2.—General Lighting Arrangements.

of a collision, involving repairs, the cost of which may far exceed the cost of the electrical plant. The installation must be as robust and reliable as it is possible to make it, as it will not receive a great deal of care, and probably no skilled attention until absolutely necessary. It will also be subject to extremes of temperature, to moisture, vibration, and frequently heavy jars.

The lighting set will, of course, be directly-coupled steam-driven, and should be fixed with the shaft running fore and aft, as, although these small tugs are unlikely to encounter rough seas, they are easily set in motion, and roll at a fairly high frequency. The small set, with a fly wheel heavy in proportion, is run at a good speed; this combination would allow comparatively large gyrostatic forces to come into play, if the set were placed with the axis of the shaft across the ship. It is essential that the engine should be arranged to exhaust either into a condenser or the atmosphere, the former not only for the sake of efficiency, but also for economy of water, as there is usually little reserve in hand, and it is sometimes not easy to obtain when required. It is not advisable to evaporate more river water in the boiler than necessary, as the water in reaches where tug boats are used frequently contains many and varied impurities. A two-way cock must, however, be provided to enable the exhaust to be turned to atmosphere when the main engine is not working, as the condenser pump will then also be out of action.

Fifty volts has been found to be a very satisfactory pressure; this is not a matter of great importance, but the greater strength of the filament of a lower-voltage lamp is one advantage. The switchboard, which should be fixed in the most convenient position close to the lighting set, should be as compact and simple as possible; a teak board constructed of battens and containing only the barest necessities is all that is required. It is possible that the omission of a voltmeter and even of a shunt

Fig. 3.—View of Wheel-box Switchboard.

regulator (employing a fixed adjusted resistance in lieu thereof) would not cause dissatisfaction, as the load is practically always the same, and the engine governor ensures better regulation than is necessary. A socket for a portable hand lamp should be provided, and, as

this will probably be left on in any case, it can be utilised to light the water gauge, the flexible being suspended on hooks so that the lamp can be easily removed when required elsewhere. Plug sockets should be provided so that this lamp can be used for inspection purposes anywhere, and it is sometimes very useful on deck. It is not necessary to connect switches for the lamps below deck, as all the lights are usually left on while the set is running, the after cabin being perhaps an exception where the light may be put out when an opportunity occurs during night work for any of the crew to sleep. The distribution board should be fixed in the most accessible position where it is not in the way in the engine room. A satisfactory board can be made of a base of a material which is unaffected by heat and moisture, and preferably not brittle, on which porcelain cut-outs are mounted; it is not advisable to use spring clips or glass doors.

The wiring is the next consideration. In the engine room and cabins, twin lead-covered wire supported at frequent intervals makes a very satisfactory job: it is easy and not expensive to install, and any unsightliness caused by sagging is not of great importance. The disadvantage that this wire is liable to injury is largely counterbalanced by the fact that, owing to its flexibility, there is no difficulty in fitting it snugly out of the way into the corners and round the awkward contours that will be encountered, and, if damage does occur, it is most likely to be in the most exposed position, and therefore in full view and accessible for repair.

To reach the fore cabin and wheel box, and possibly back to the side lights, the wiring must be carried past the boiler, and the choice has to be made between running within the boiler space or outside. In the first case, there are the objections that the temperature may be very high and the space almost inaccessible, probably entirely so when the boiler is hot, and, in the alternative, that the wiring is exposed not only to the severe weather conditions, but also to great risk of mechanical injury. Which is the lesser of the two evil ways depends upon the size and type of craft, but, if it is possible, it is advisable to carry the wiring inside. In either case it must be borne in mind that a repair may be required in haste, and while the tug is working. For this portion of the wiring, either inside or out, it has been found satisfactory in practice to use solid-drawn galvanised steel tube, each tube containing one twin c.t.s flexible cable for each circuit. The runs should be kept as straight and free from bends as possible, and the tubes of ample size, so that a new lead can be drawn in from end to end. The ends of each tube run should be taken into a junction box with porcelain interior; the opposite side of the box to the tube entrance can then be fitted with a nipple and bush to take the lead-covered wire to continue the circuit.

Each of the four leads from the wheel box switches which feed the navigation lights should end in a fixed metal socket, a twin c.t.s. flex connected to each of these lights having a plug at the other which fits this socket. These plugs and sockets, being outside and exposed to all weather conditions, should be the best obtainable for the purpose, and the socket should be provided with a metal cap cover when the plug is withdrawn. The sockets would be fixed on the hatch combings and connected from behind, so that the wiring is all inside. The two leads for the mast lights would be attached to the mast by saddles, but it is sufficient for the side lights to be twisted round the iron stanchions; it is in either case easy to renew this exposed portion of the work, as it is not necessary to interfere with the protected wiring up to the socket.

It is frequently necessary for a tug to lower her funnel and mast when passing under a bridge, and it is essential that she should still show correct lights. To accomplish this, the two mast lamps should be carried on a vertical spar suspended above its centre to the top of the mast and pivoted near its base, and the whole so arranged that when the mast is lowered (forward) the two lights would still show over the bow in the same relative position. The c.t.s. flex must be given a complete loop at the pivoting points, and sufficient slack at the base of the mast to allow this movement to take place without tightening the flex.

It will often be found that tug owners have not sufficient faith in electric lighting to rely entirely upon it for the lights above deck, and, wisely, perhaps, prefer to keep oil lamps ready in case of emergency. Facilities must, therefore, be made for changing quickly from one to the other. There should be no difficulty in designing a simple fitting to which the lampholder is fixed, to fit inside the side light lanterns in such a manner that it can be immediately withdrawn with the attached flex, and an oil lamp substituted. It is not as easy to adapt the mast lamps in this manner, as the flex is attached to the mast by saddles. The old mast with oil lamps complete is, therefore, sometimes kept as spare, and entirely new gear provided for the electrical equipment.

The switchboard in the wheelbox calls for special attention. It should be mechanically strong and weatherproof, even while the switches are being operated, but all parts should be easily accessible. An arrangement, which has been found to be entirely satisfactory, consists of a cast-iron case with cover hinged at the top, which makes a water-tight joint when closed and tightened by a fly-nut. Within is a board of non-hydroscopic insulating material, fixed by screws to two battens of the same material, so as to allow ample space behind it for the incoming leads and connections. On the front of this board are four switches fixed in the same relative positions as the lights which they control, *i.e.*, one at the top in the middle for the top mast light, one vertically beneath for the mast light, and one on each side at the bottom for each side light. When the cover is closed, each switch is operated from outside by means of a spindle passing through the cover, the outside lever on the end of the spindle being in a vertical position when the switch is on and horizontal when off. Four miniature batten holders are fixed on the board inside for pilot lamps, one above each switch and connected in series with it, a glass window in the iron cover coinciding with each lamp. These windows are made of plain ground glass, and the two at the bottom have also red and green glass for the port and starboard lights respectively. These lamps are screened from each other by sheet brass partitions to prevent a window being illuminated by any but its own lamp. Thus, a facsimile of the tug lights is in full view of the steersman, so that he can assure himself that the correct lights are showing, and is made immediately aware of the failure of any of them.

The pilot lamps are at low voltage, and selected of such a size that they require a slightly larger current to light them fully than they will get when connected as above; if, for instance, the navigation lamps are 30 W on a 50-volt circuit, the pilot lamps might be 2 W at 3 volts (metal filament). They are thus underrun, which tends to increase their life, and allows them to give a slightly more subdued light, this being an advantage, as anything brighter than the merest glimmer is sufficient to cause a blinding effect on a dark night. A short-circuited adaptor is attached to each pilot lampholder to replace a burnt-out lamp, should a spare not be at hand.

These notes refer to installations in the smallest type of these craft, such as are to be seen in numbers on any of our water highways. The equipment of larger vessels presents no particular difficulties, as the conditions are more nearly those of an ordinary shore installation.

Apart from the facility of switching on the towing light, it might appear a superfluous luxury to fit such small vessels with electric lighting, but the great improvement in the engine room illumination and the convenience of a portable hand lamp for the inspection of out of the way mechanism must tend toward higher efficiency, and eventually considerably affect the maintenance costs, although this might not be immediately apparent.

The steam used for the tiny set (about 300 to 350 watts) is almost negligible, and the difference in coal consumption certainly not noticeable, but the reduction almost to vanishing point of the cost of oil lamp and lamp glass repairs and renewals, a surprisingly heavy item, and of the cost of lamp oil is at once evident.

The Staveley Coal and Iron Co.

Some impressions of a visit to a few of the company's works and collieries where electricity is economically generated and extensively utilised for coal winning and the manufacture of by-products, and also distributed for public supply purposes.

PUBLIC electricity supply has been so much in the limelight in the past few years (and quite rightly so) that what is being done in the way of electricity supply by private concerns has probably come to be regarded as of minor importance. The importance of such work, however, is illustrated by the activities of the Staveley Coal & Iron Co., Ltd., near Chesterfield, which might be described as a large generating and distributing undertaking, as well as a large coal-producing and manufacturing concern, in which sense it is a very large power consumer.

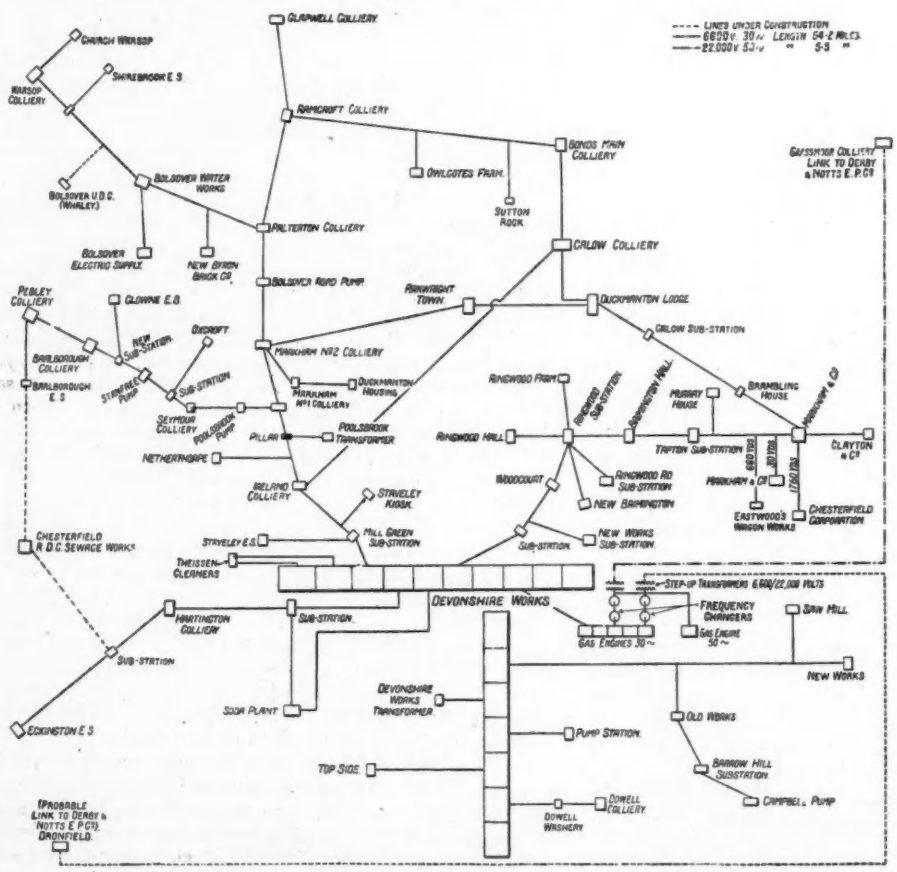


Fig. 1.—The Staveley Co.'s E.H.P. Network.

The activities of the company, of course, are centred round the production and treatment of coal, and cover a large area of some 60 sq. miles in which there are six collieries belonging to the company, three large works, Devonshire, old and new, devoted to obtaining by-products, three power stations, and 151 miles of h.p. and e.h.p. transmission lines serving a l.p. network to which about 7,000 consumers are connected.

Regarding the company first as a supply undertaking, it is in a particularly favourable position from two very important points of view: first, practically the whole of the power production is by the utilisation of waste heat from the coal-treatment part of the business; and, secondly, the undertaking can to a great extent control its own load factor by putting on load in its own works when convenient. Low-calorific gas of about 100 B.th.u. per cu. ft. at 68 deg. F. is used both for firing boilers for the production of steam for turbine plant and for driving gas engines, and the annual load factor is in the neighbourhood of 70 per cent. The total capacity of a.c. plant installed is 27,000 kW. Last year 70 million units was the output of the whole concern, of which about 25 per cent. was sold to outside consumers. The company supplies in bulk to the Derby and Notts. Power Co. A number of outside collieries is served by the Staveley concern, which also supplies several pumping stations in the district and a number of villages.

The cost of generating electricity is so low that the company is able to dispose of its output, with a reasonable profit, at an average figure of 0.55d. per unit, which, we believe, is the lowest figure of its kind for the whole country.

To deal first with the generating plant in use by the company, as already indicated the bulk of the electricity is produced at Devonshire works and from very-low-grade gas. The gas is obtained from blast furnaces, and before use under the boilers or in the gas engines it is treated in a cleaning plant consisting of three vertical water scrubbers, each 15 ft. in diameter and 72 ft. high, filled with wooden hurdles, and down which 5,000 gallons of water per minute is circulated. The water is pumped to the top of the towers by duplicate Worthington-Simpson pumps, each capable of dealing with 5,000 gal. of water per min., driven by 300-h.p. motors. The gas then passes through three Thiessen washers in parallel, fig. 2, each capable of dealing with 211,800 cu. ft. of gas per hour. These are mechanical centrifugal water washers. The water used in this plant, containing the solid matter washed from the gases, passes to a Dorr clarifying pond to separate the suspended solid matter, and is then pumped to an open spray cooling pond, where it is cooled and again collected and re-circulated to the scrubbers. Each washer is driven by a 500-h.p. A.C.E.C. slip-ring motor, 575 r.p.m. Three smaller Thiessen

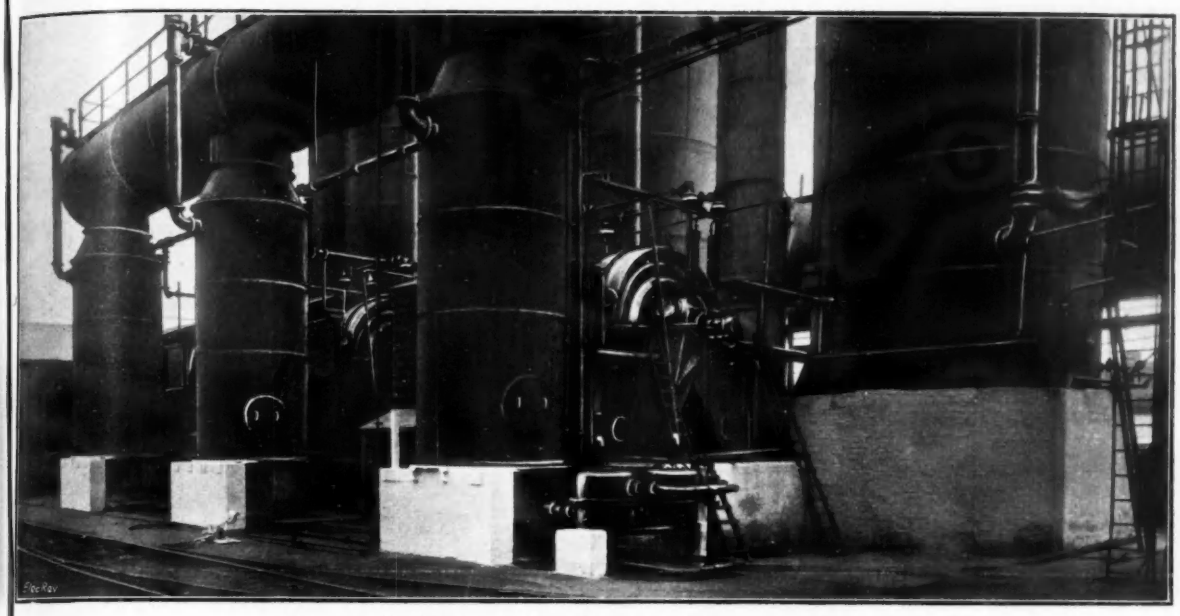


Fig. 2.—" Thiessen " Gas Cleaners; 500-h.p. Motors.

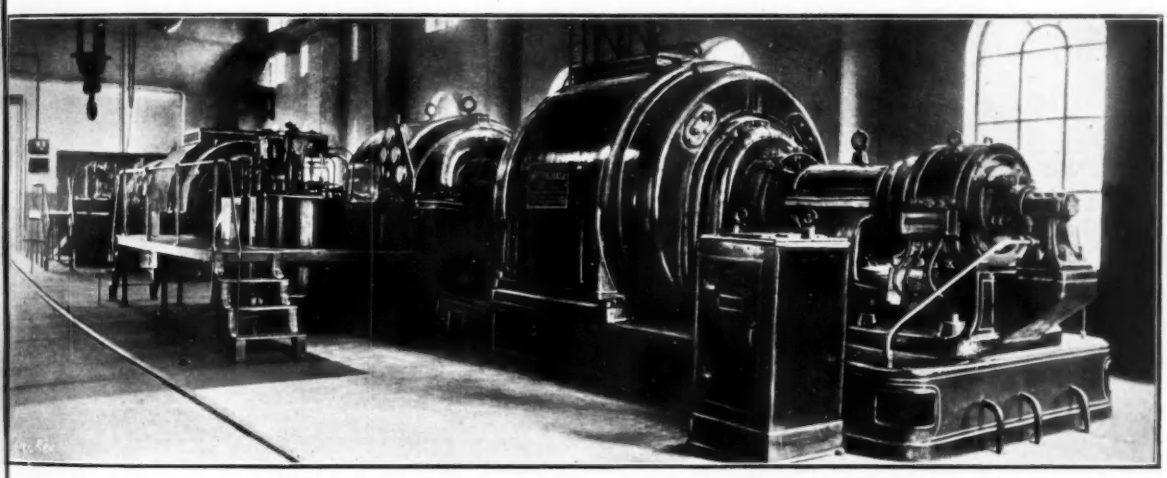


Fig. 3.—Turbo-alternator Plant at the Devonshire Works.

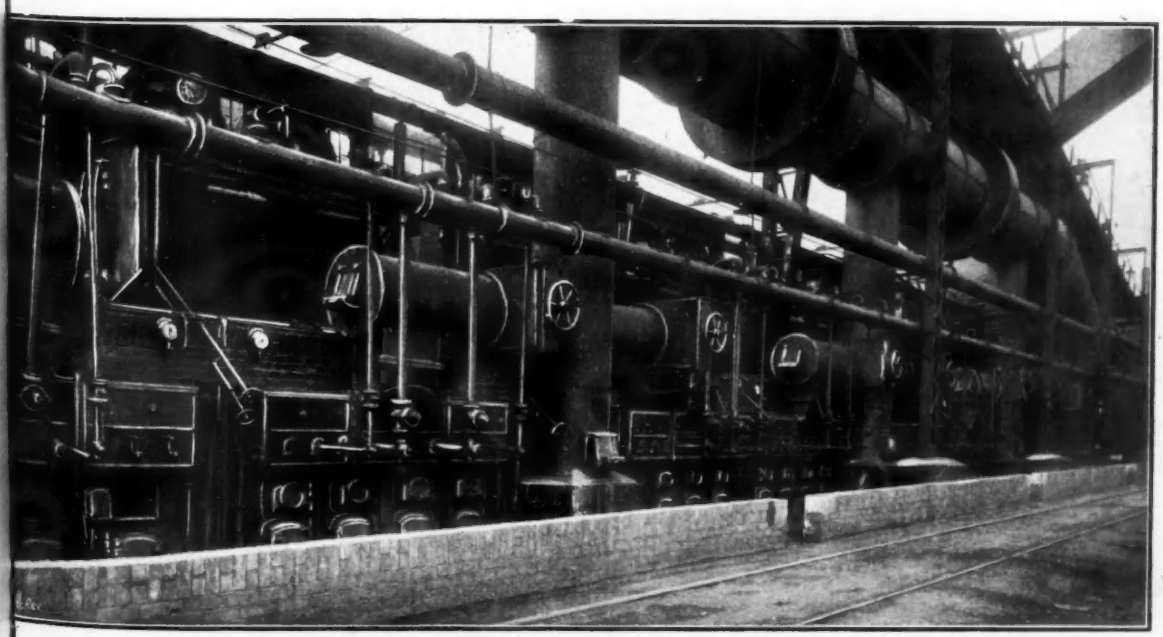


Fig. 4.—A Portion of a Battery of Gas-fired Boilers.

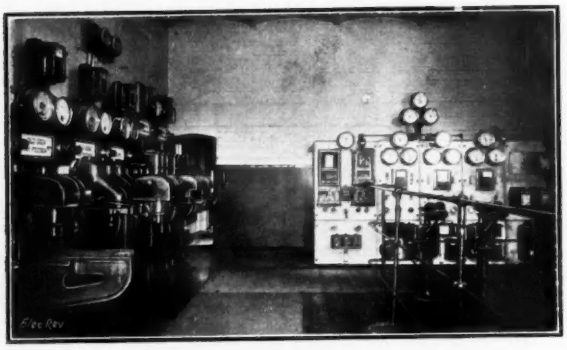


Fig. 5.—H.P. Switch and Control Gear.

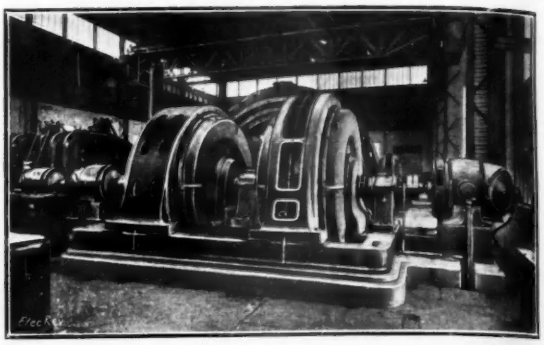


Fig. 6.—One of the Frequency Changers.

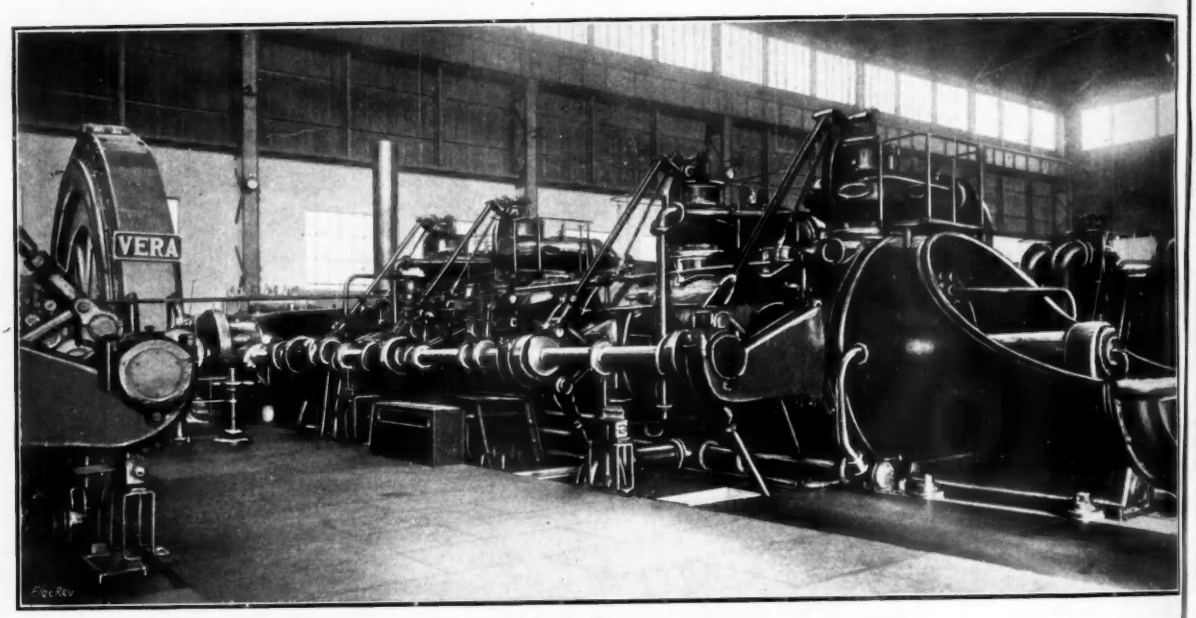


Fig. 7.—One of the 5,000-h.p. Tandem Gas-engine Sets.

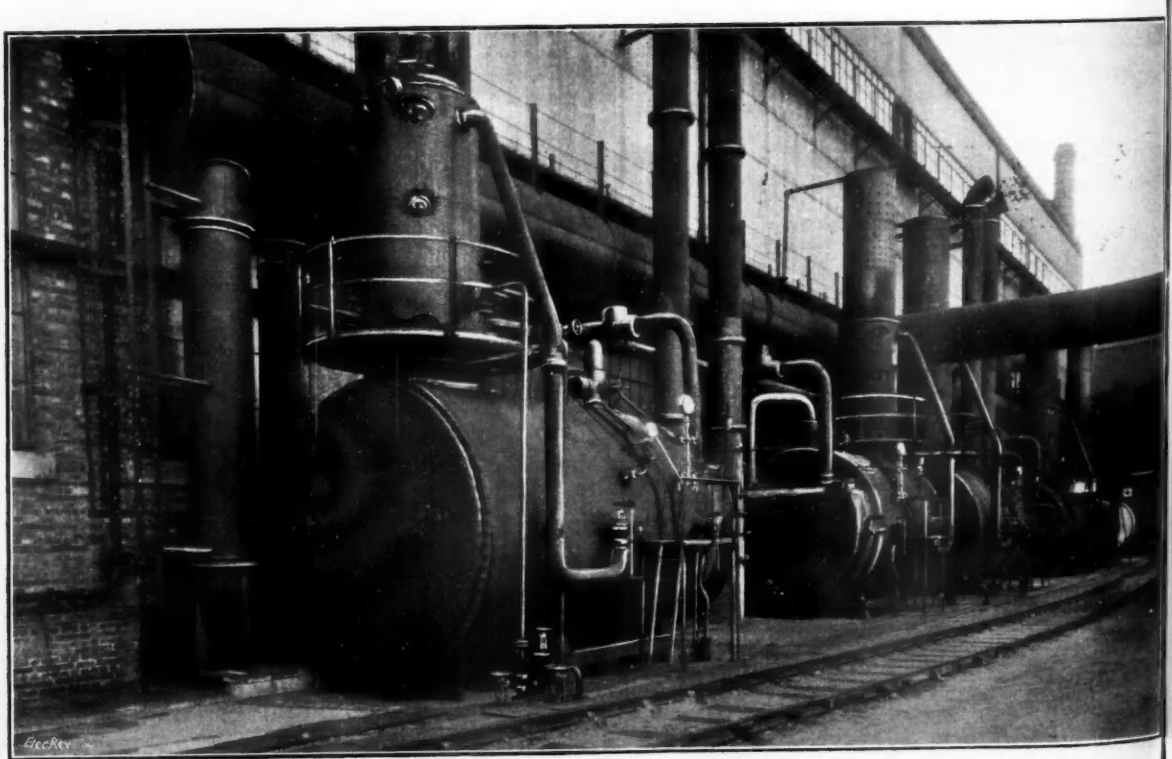


Fig. 8.—Multi-tubular Boilers for Utilising Exhaust Heat from Gas Engines.

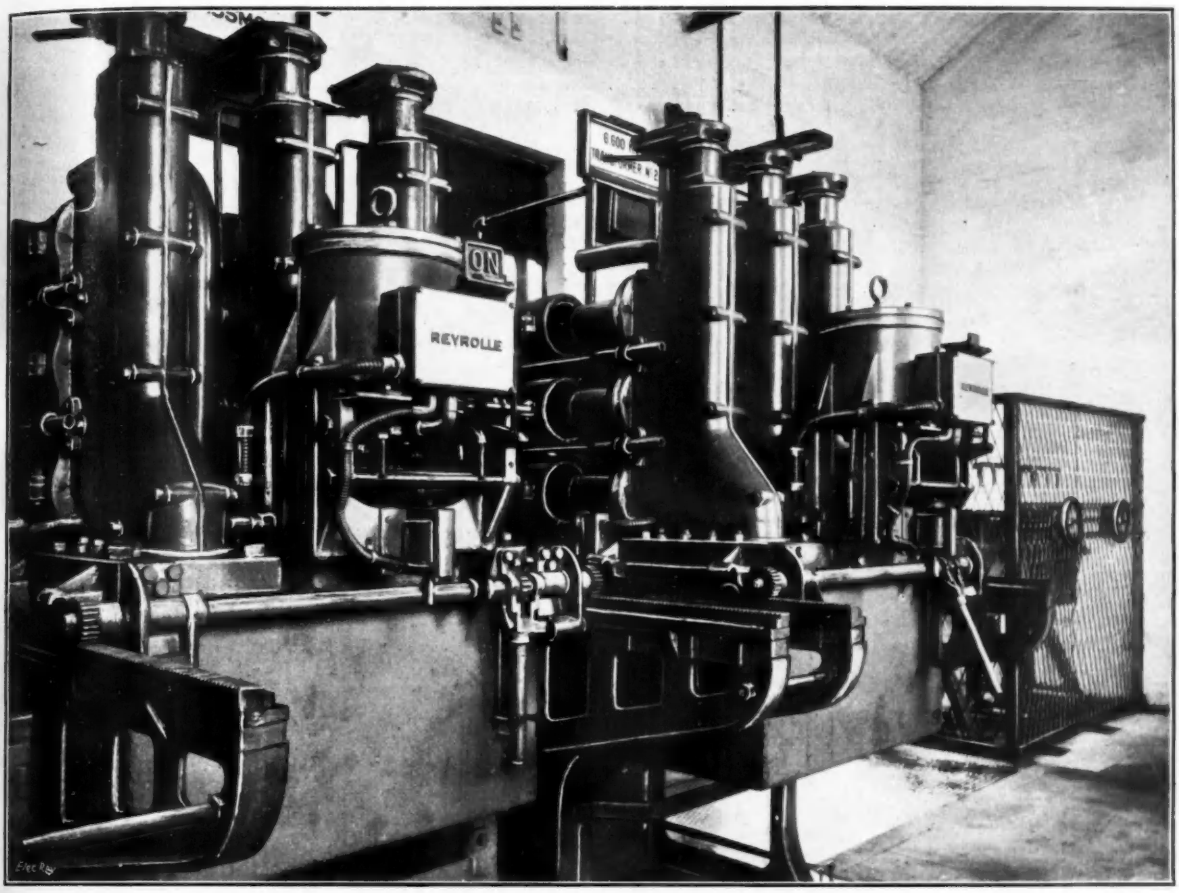


Fig. 9.—22,000-V Switchgear Controlling Transmission System.

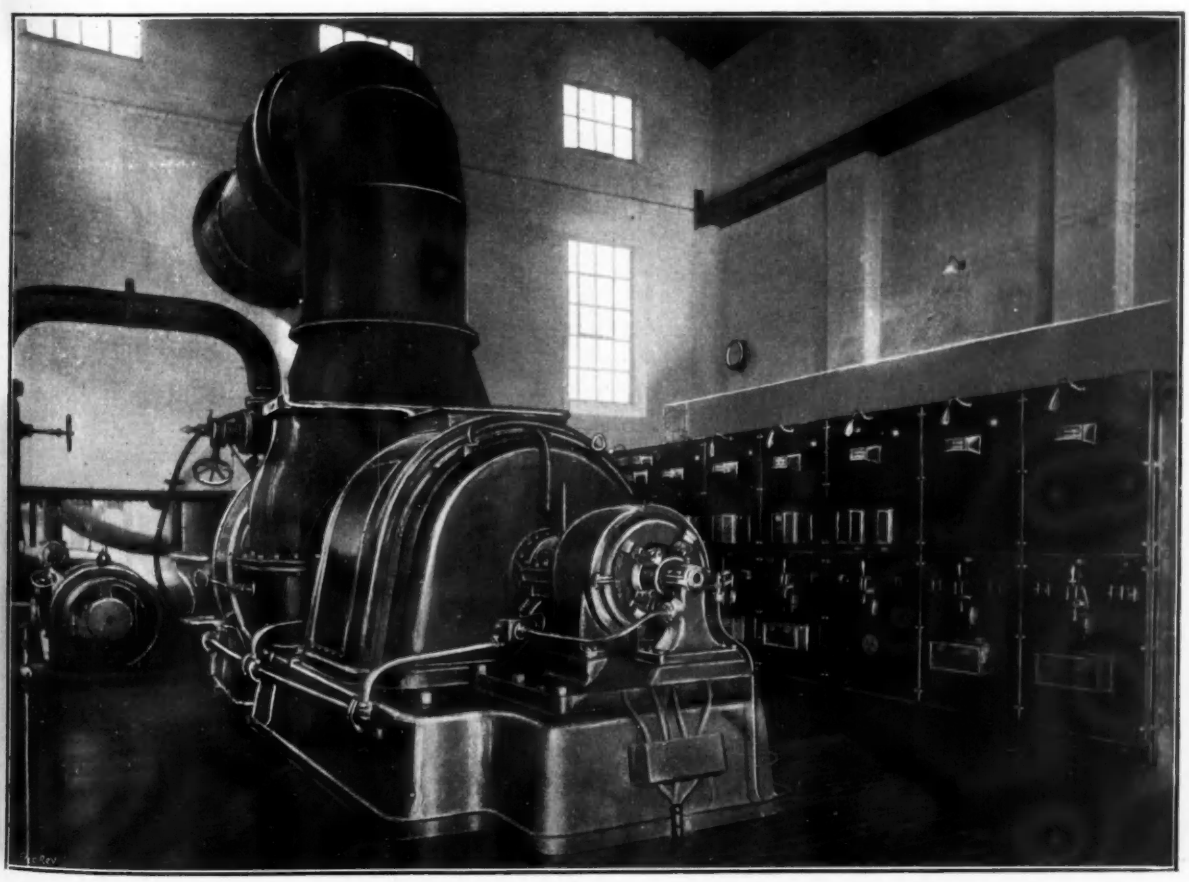


Fig. 10.—Interior of Markham Power House; 1,500-kW M.P. Turbo-alternator.

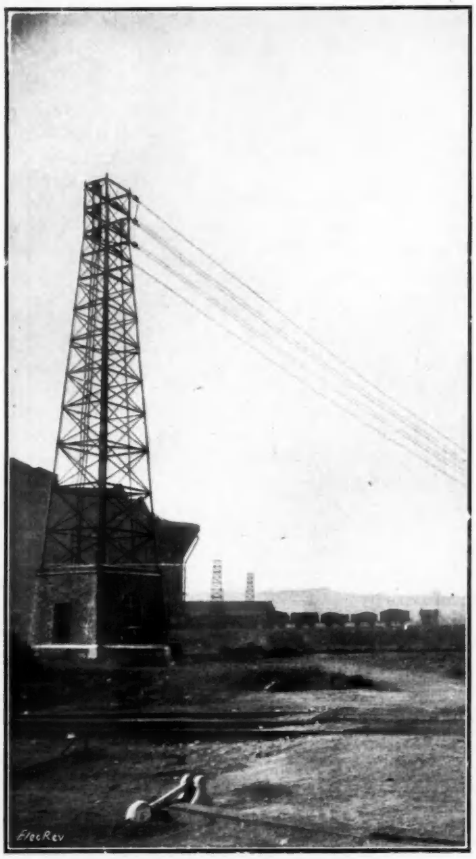


Fig. 11.—22,000-V and 6,600-V Line; Sub-station in Tower Base.

Fig. 12.—Terminal Pole at Grassmore; 3-core Cables Slung from Steel Poles.

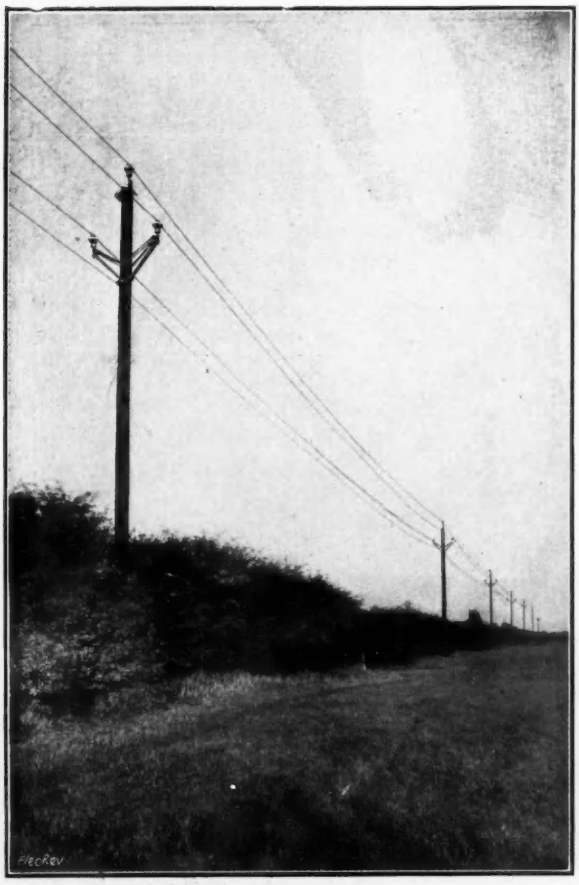


Fig. 13.—6,600-V Line; Bird-guard Brackets.

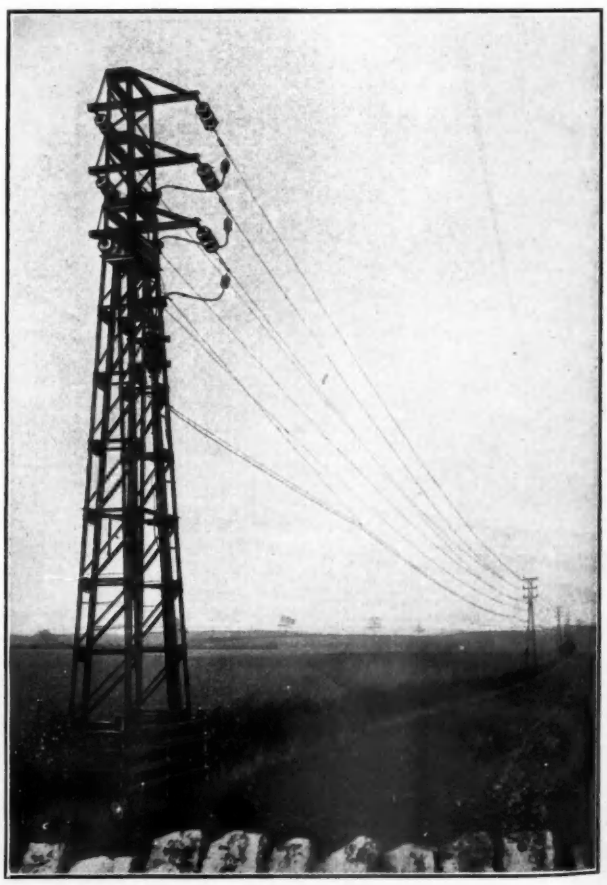


Fig. 14.—Six-wire Line on Lattice Towers.

washers deal finally with the gas before it is used. The boiler plant consists of 20 Babcock & Wilcox water-tube boilers, with a total capacity of 415,000 lb. of steam per hour. The steam conditions are 160 lb. per sq. in. and 570 deg. F. Sixteen of these boilers are fired with gas from the blast furnaces, as already explained, and the remaining four are served with gas from coke ovens. Eight waste-heat boilers are equipped with stoker grates for coal firing in case of emergency, and oil-firing is also provided for on seven other boilers. The boilers are all installed out in the open, and their working is very satisfactory. Fig. 4 shows a portion of one battery of boilers.

The generating plant proper is installed in two separate buildings, one housing the steam-driven equipment and the other the gas-engine sets. In the steam section there are a 5,000-kVA and a 3,000-kVA mixed-pressure, Metropolitan-Vickers, turbo-alternators, fig. 3, and a 1,000-kVA exhaust-steam turbine set of similar make, generating at 3-phase, 6,600 V. Low-pressure steam for the m.p. and l.p. turbines is obtained mainly from the exhaust from five large Galloway vertical blowing engines installed in the steam power house; these are employed to serve the blast furnaces. There are also two d.c. Browett & Lindley reciprocating-engine sets, 1,000 kW and 500 kW, respectively, which act as stand-by to a 1,500-kW M.V. rotary convertor. The latter machine is of the double-commutator type, an essential arrangement to permit of a large output at such a low voltage, 250 V d.c. Double slip rings on the a.c. side are also provided, and the machine runs at 360 r.p.m. Reyrolle standard h.p. switchgear controls the alternators and various feeders. This, with a portion of the control board, is shown in fig. 5. For use in connection with the condensing plant for the turbines there are three cooling towers by the Premier Co. and three by the Davenport Co.; each set of three has a capacity of 200,000 gallons of water per hour.

In the gas-engine house there are three 7,150-h.p. 4-cylinder tandem-type gas-engines by the Société Anonyme John Cockerill driving 5,000-kW alternators of A.C.E.C. manufacture. These are believed to be the largest gas engines installed in this country. Two of the alternators are 30-cycle machines and run at 90 r.p.m., while the third one supplies at 50 cycles and runs at 94 r.p.m. The alternators are of the fly-wheel type and are excited by means of three 110-kW motor-generator sets, 220 V d.c. Fig. 7 is a view of one of the gas-engine sets, looking at the alternators through the avenue between the two sections of the tandem.

It is particularly interesting to note that even the exhaust from the gas engines is not wasted, but is discharged into three pairs of multi-tubular boilers of special design, fig. 8, which provide additional steam for general purposes throughout the works. Each pair of exhaust-heat boilers can raise 14,000 lb. of steam per hour at 150 lb./sq. in. and 115 deg. C. superheat.

In this section of the station there are two 2,500-kW rotary frequency changers, 50/30 cycles, 600 r.p.m., fig. 6; these are synchronous machines on both sides. Separate exciters are supplied for both sides of the changers, and for starting there is an induction-type pony motor equipped with a liquid rotor resistance. The main switchgear for the gas-engine section (M.V.), in addition to serving for the alternators, also controls the a.c. sides of frequency changers and some 6,600/22,000-V step-up transformers for the transmission system.

At the Markham power station there is a 1,500-kW mixed-pressure turbo-alternator of British Thomson-Houston manufacture, 1,800 r.p.m., 6,600 V, fig. 10. Low-pressure steam for this turbine is obtained from the exhausts from the winding engines and air compressors at the colliery, while h.p. steam is supplied from suitable boiler plant. A feature of this plant is that the turbine exhausts into a surface condenser in the open, *via* an overhead duct. The back pressure introduced by the duct is very small, while the condenser is in the coolest possible place and foundation work is eliminated to a very considerable extent. At the Warsop collieries there is a 1,200-kW A.E.G. mixed-pressure turbine set, 440 V, for the supply to the colliery.

With regard to the distribution side of the undertaking, fig. 1 will give some idea of the extent of the e.h.p. system. Most of the e.h.p. transmission is by overhead lines; the bulk is at 6,600 V and there is also some at 22,000 V. All the company's own collieries are supplied at the lower pressure, which also serves for some outside collieries and practically all the villages in the district, including some not owned by the company. The higher pressure is employed for transmission to the Grassmoor Colliery Co., and also to the Derbyshire & Notts. Power Co. Most of the 6,600-V overhead lines consist of 0.1 sq. in. bare copper wire carried on simple wood or "Kay"-type poles by Callender's Cable & Construction Co., Ltd. A typical example of a 6,600-V line is that shown in fig. 13. It is an ordinary 3-wire line on wood poles. A feature is the special design of the insulator brackets, which eliminates the necessity for the use of bird guards. It is interesting to note how the line is erected in the hedge bottom, the usual practice of the company wherever possible. A six-wire, 6,600-V line on lattice towers is shown in fig. 14; in this case a telephone cable is suspended from the towers. It has already been indicated that the supply for the 22,000-V system is stepped-up from the 6,600-V supply at Devonshire works. Fig. 9 shows the 22,000-V Reyrolle switchgear controlling this supply.

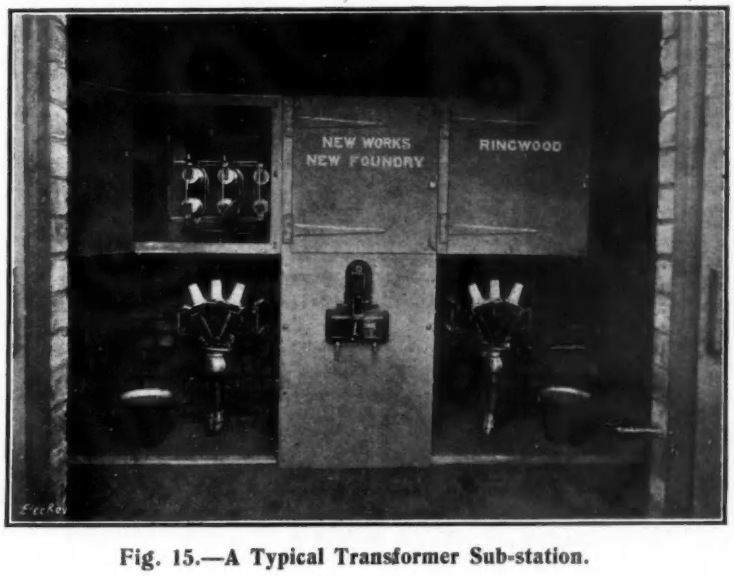


Fig. 15.—A Typical Transformer Sub-station.

Fig. 11 shows a lattice tower at the Devonshire works, carrying both 22,000-V and 6,600-V lines. The tower is 79 ft. high and a sub-station is built in its base. Fig. 12 shows the terminal pole of the 22,000-V single-circuit line at Grassmoor. Two sets of single-core cables lead to the overhead lines, cable-dividing boxes being arranged horizontally at the foot of the pole. The three-core cables to the trifurcating boxes are slung across the colliery yard from catenary wires on steel poles.

There are some 75 transformer sub-stations on the system, a typical example of which is shown in fig. 15. This illustration depicts the T cubicle; one end of the T box is open, and the isolators are visible.

In conclusion, we are indebted to the Staveley Coal and Iron Co., Ltd., for permission to visit its property and to take photographs, and to Mr. Scott Mackenzie, M.I.E.E., chief engineer to the Staveley Co., and Mr. Abell and other assistants for their help in gathering the above information.

G

The Electrification of Russia.

An Ambitious Programme of Construction and Extension.

By LOUIS SEGAL, M.A., Ph.D.

THE work in connection with the electrification of Russia which is at present being carried out represents in the main the realisation of the programme elaborated by the State Electrification Commission in 1920. The programme provided for 39 regional power stations to be working in the year 1933. The progress of industry necessitated, however, the extension of the original programme to 48 stations with a capacity of 2,955,000 kW. In addition to the stations to be completed by that year, nine regional stations are to be under construction in 1933, which, together with the extension of existing stations, should increase the capacity of regional stations to 4,555,000 kW.

Regional power stations have begun to assume the leading *rôle* in supplying power in Russia and a great expansion in their construction is to take place during the current financial year. According to the programme, eight new regional stations which are at present under construction will start operating during the 1929-30 financial year (October 1st, 1929, to September 30th, 1930), as compared with ten stations which started operating in the preceding seven years. The new power stations to be started this year include the Shakhta with a capacity of 44,000 kW, which will supply power to the South-Eastern section of the Donetz basin and the industries of the Rostov region; and the Chuguyev station of similar capacity, which is to supply electrical energy to the town of Kharkov, the capital of the Ukraine. A 22,000-kW regional station is to be completed in Kiev; in Novorossisk one of 22,000 kW; in Krasnodar one of 11,000 kW; in Saratov one of 11,000 kW; in Cheliabinsk one of 49,000 kW; and in Ossinov, White Russia, one of 20,000 kW.

The total capacity of the new stations to start operating during the current year will be 223,000 kW. In addition to those, seven of the existing stations will be extended by 180,500 kW. The most important of these are the second installation at the Leningrad peat station, and the extension of the Shterovka and Nizhni-Novgorod regional stations. If we deduct the capacity of generators at the various stations which will be put out of commission during the year, the net increase in the capacity of the regional stations will amount to 388,500 kW. This represents an increase of 51 per cent. over the capacity of such stations on October 1st, 1929. At the end of the 1929-30 financial year it is estimated that a total of 27 regional power stations will be in operation with a capacity of 1,151,000 kW, as compared with 328,000 kW before the war. Beside the completion of eight regional stations, the programme for 1929-30 provides for the continuation of the work on a number of stations now under way, and the starting of eight new regional stations of the usual type and six special regional stations, which are to supply not only electric power but also heat.

In the Moscow area the construction will begin of the Bobrikov station, which is to use as fuel coal obtained from the Moscow region. Its initial capacity will be 150,000 kW and its eventual capacity 300,000 kW. In addition to the Bobrikov station, two others with a capacity of 150,000 kW will be constructed in Moscow. These are designed chiefly for supplying power for industrial purposes.

The construction of a motor car factory with an output capacity of 120,000 cars per annum in Nizhni-Novgorod necessitates an increase in the supply of electric power in that city. It has therefore been decided to build a new station on the Lukh River near the peat bogs of Ivanovo-Voznesensk. This station will be connected by h.p. transmission lines with the Nizhni-Novgorod and Ivanovo-Voznesensk electrical systems. It is aimed to increase by 1932-33 the output of the stations in those two regions to 1,500 million kW-hours. In that year the system is to be connected to that of Moscow, the output of which for the same year is estimated at 2,300 million kW-hours. It is anticipated that by that year the supply of electric power will fully satisfy the needs of the central industrial region which includes these three areas.

The electric power combine next in importance is the Zuev regional station, which is to be erected in the Donetz basin. The construction of this station will begin during the current financial year. It will use anthracite slack and will have an initial capacity of 88,000 kW.

The power station which has been constructed at the Don Soda Works is to be extended by 44,000 kW and is to become a regional station instead of being as at present a purely industrial one. A new station is also planned for the Lisichansk coal district in the Donetz basin. In the northern part of the Donetz basin, near Slaviansk, it is planned to construct a large industrial power station with a capacity of 75,000 kW to supply power to the chemical and other industries of the Donetz basin. The total power production in that area is estimated to reach a total of 2,000 million kW-hours by the financial year 1932-33.

In Transcaucasia, the recently completed hydro-electric station at Zemo-Avchalsk is to be connected with the Rion station now under construction. This combination is to have a capacity of 80,000 kW and will serve the Chiatura manganese mines as well as the Suramsk section of the Transcaucasian railway. The power stations in the Armenian Republic are also to be united in one system.

In the Leningrad area the programme provides for starting, in 1930, the construction of three heat and power stations with a total capacity of 65,000 kW. Preliminary work will also begin in connection with the construction of a new regional power station to use peat as fuel. At present work is proceeding in connection with the expansion of the second municipal station by 48,000 kW as well as the construction of the Svir hydro-electric station with a capacity of 180,000 kW.

Among other new stations the construction of which will begin during the current financial year the following should be mentioned: the Kazan central power station, capacity 15,000 kW; the Baksan (Mineralniye Vody) hydro-electric station, 25,000 kW; the Kuznetsk regional station, initial capacity 48,000 kW; the Ubinsk hydro-electric station in the Altai district of the Kazak Republic, to supply power to the non-ferrous metal works, 40,000 kW; and two hydro-electric stations near Tashkent in the Uzbekistan Republic. Of the last, the Chirchik station with an initial capacity of 40,000 kW will work in conjunction with a large factory engaged in the production of fertilisers for cotton growing, while the Kadirya station of 30,000-kW capacity will supply power to the city of Tashkent.

Among the central stations to be extended in the Urals during the 1929-30 financial year are the Kizelov and the Cheliabinsk stations, the capacity of each of which will be increased by 48,000 kW.

One of the principal problems in connection with the construction of power stations will this year be to reduce

the duration of the period of construction. In particular the Svir hydro-electric station, near Leningrad, is scheduled to be completed in four years as against the original plan of five years. In addition to the construction of regional stations during the current financial year, there will also be constructed a number of factory, municipal, and rural stations as a result of which the capacity of power stations in Russia is to reach the total of three million kW by the end of the current financial year, which is about three times the 1913 figure.

The increase in electricity output shows an even greater progress than the construction of stations. While in 1913 output amounted to 1,945 million kWh, in 1926-27 it reached 4,100 million kWh, and in 1928-29 to 6,700 million kWh. The estimates for the current financial year are for an output of 9,000 million and for 1932-33 for 19,000 million kWh. The capital investment in electrical construction during the current financial year will amount to 700 million roubles, or approximately, £70,000,000.

Electricity for the Home.

Notes on the Tonbridge Undertaking; Selections from Manufacturers' recently introduced Products.

TONBRIDGE receives its electricity in bulk from its neighbour, Tunbridge Wells, its own generating plant being employed as stand-by and for use on peak loads during the winter months.

We were very interested to learn that meter rents had been abolished. The ordinary consumer never likes the idea of having to pay rental for a device which, he thinks, is put in solely for the suppliers' benefit. The rates of charge are quite reasonable for a country town, being 5½d. per kWh for lighting and 1½d. for heating, &c. In the outlying districts, some of them 5½ miles from

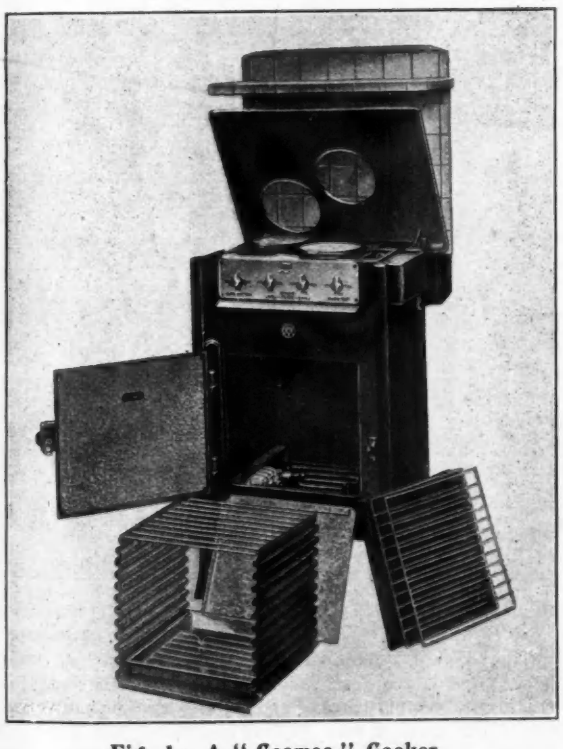


Fig. 1.—A " Cosmos " Cooker.

the works, higher charges are made. A two-part tariff is available, consisting of a fixed charge of 20 per cent. of the ratable value per annum, and a " unit " charge of 1d.

The assisted wiring scheme instituted by the Department is perhaps unusual. It applies only to lighting installations which are carried out by local electrical contractors to a schedule drawn up by the engineer, Mr. M. P. Plunkett. A prepayment meter is fitted set at 1s. per kWh, and 6½d. in the shilling represents repayment of the installation costs. No interest charge is made during the first year; 5 per cent. is charged on any outstanding balance at the end of that period.

Cookers are hired and hire-purchased, and while no particular make has been "standardised," there is something of a preference for the " Cosmos " cooker fitted with enclosed grill and boiling plates. The smaller model which is employed in the scheme is designed for fulfilling the requirements of three or four persons, and is constructed from selected sheet steel. The cooker has a stoved black-enamel finish, with mottled-grey enamel top plate and door panel, and round mouldings. The cooking space is 13 in. by 12 in. by 12 in., and the oven has a loading of 1,825 W; the grill loading is 700 W, and those of the two hot-plates 1,200 and 1,000 W, respectively. A view of the cooker demonstrating the ease with which it can be taken to pieces for cleaning appears in fig. 1. The cooker is supplied by METRO-VICK SUPPLIES.

A New Table Cooker.

We have received from the STOKES TABLE COOKER Co., 131, Woodhouse Lane, Leeds, a small electric cooking appliance invented by Lady Stokes, widow of the late Sir Wilfrid Stokes. It comprises an alu-

Fig. 2.—The " Stokes " Table Cooker.

minium pan, about 10 in. in diameter and 2½ in. deep, in the centre of which is fixed a 500-kW element. The latter is protected by a wire guard, and on the outside of the pan are heat-insulating feet. In use the cooker is put over a plate upon which the food to be cooked is placed. By this means grilling operations are carried out very rapidly and efficiently. The pan is fitted with a convenient wooden handle through which the connecting flex passes. The cooker, which is illustrated in fig. 2, has to be taken apart for cleaning, it being necessary to unfasten three nuts and unscrew the handle. The appliance can be used as a heater if desired.

Modern Lighting Appliances.

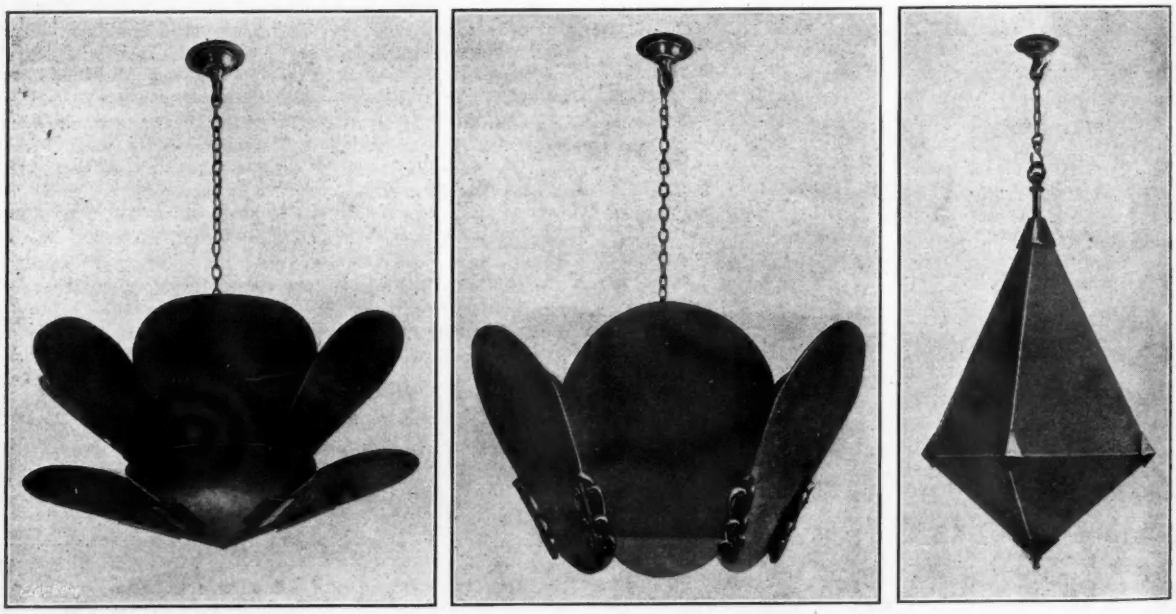
The accompanying illustration, fig. 3, shows the "Electa" table lighting standard which has recently been introduced by Electric Art Shades (1928), Ltd., Feering Factory, Kelvedon, Essex. It is supplied complete with 3 yards of flex, a switch lampholder, a standard plug (or adaptor) and a tilting parchment

Fig. 3.—The "Electa" Table Standard.

shade. It is of graceful lines, and sheds, it is claimed, a soft and mellow radiance not trying to the eyes.

The standard is polished-oak finished and is fitted with a beautifully made tilting parchment shade, thonged with good-quality leather. The shade may be obtained in several shaded colours.

The last two or three years have seen a considerable increase in the number of electric light appliances in the modern manner that have been installed principally in hotels, shops, theatres, and restaurants, and an increasing interest and appreciation on the part of the general public has made itself evident. Mr. Eric Marx, Central House, 34/36, Oxford Street, W.1, has now produced a range of appliances suited to domestic use in the moderate home. These are made in a manner covered by a provisional patent, and are both simple to erect and easy to keep clean. The metalwork casts no shadows, and the lamps hang behind the tinted glass and diffuse the light evenly without glare. In appearance the appliances are unique and of attractive shapes, and they can be supplied in glass-tinted amber shaded to yellow, yellow shaded to white, pink shaded to white, or in plain glass. We illustrate three of these appliances in figs. 4 to 6. The two-tier model No. 8225, fig. 4, is exceptional in that it takes only one 100- or 150-watt lamp which lights both tiers. No. 8199 model, fig. 5, also takes only one lamp, and the glass base clear of any metal work at the centre allows plenty of light to be thrown down on to a dining room table, for example. The enclosed model No. 8188, fig. 6, takes four lamps and is intended for offices, shops, showrooms, churches and restaurants, and is dustproof. The last mentioned model fulfils the need for a modern-style industrial unit that is inexpensive and attractive in appearance, while the provision of four lamps reduces the likelihood of sudden failure of the light; it is only supplied in plain frosted glass. These appliances are of British manufacture throughout.



Figs. 4 to 6.—"Electra" Modern Electric Lighting Fittings.

An All-Electric House.

In a paper read recently before the Electrical Association for Women, Mr. C. F. Wells, A.I.E.E., sales engineer to Electrical Distribution of Yorkshire, Ltd., said he had equipped his house throughout with electrical apparatus, and last year he used electricity to the exclusion of any other form of heat. The household consisted of three adults and three children, and the consumption of electricity for 1928 was 14,500 units, which cost £32. The charge for electricity was based on a fixed charge of 15 per cent. per annum of the net ratable value of the property, plus ½d. per unit. The 14,500 units was made up approximately as follows: lighting and small appliances, 1,600 units; cooking, 2,100 units; water heating, 4,000 units; and radiators, 6,800 units.

The principal domestic requirement in the house was heat. It was required for a large part of the year for raising the temperature of rooms, and all the year round for water heating and cooking purposes. In choosing electric fires it would be fairly safe to allow about 1½ W per cu. ft. of space to be heated. An average household of five persons would normally use about 4,000 to 5,000 units per annum for room heating.

The merits of electric cooking were well established, and it was interesting to remember that there were more cookers per head of population in this country than there were in America. With regard to water heating it was advisable to utilise apparatus which was specially designed for the purpose rather than to convert existing systems. The most satisfactory type of apparatus was the electric storage cylinder, automatically controlled.

Electrical Engineers' Accounts.

An Outline of a Practical System of Book-keeping.

By S. HOWARD WITHEY, F.C.I., &c.

THE enormous growth in the demand for electrical energy, side by side with recent developments in engineering and the great expansion of the world's banking and commercial credit systems, calls for the adoption of accounting methods calculated to enable the electrical engineer—whether in business on his own account, a partner of a firm, or a director of a limited liability company—to prepare reliable trading accounts, profit and loss accounts, and balance sheets exhibiting a true and correct view of the state of the financial affairs of the business.

Commencing with the orders received, these should be recorded in a special book kept for the purpose. Whether they come to hand through the medium of the post; from agents, travellers, representatives, &c.; or over the telephone, the orders should be passed through the order book in a systematic and businesslike manner, and should not be allowed to accumulate in a drawer or on the office desk. Each entry should show the date on which the order was received; the name and address of the customer; a detailed specification of the power units, plant, equipment, or appliances required; and the current rate or price. In addition, columns should be provided in this book for the insertion of the date of supply or dispatch, and any remarks or observations of a special character associated with the transaction, while to facilitate future reference to details it is a good practice to show against each order the folio of the day book on which the sale transaction has been recorded.

When an order has been completed, the transaction will pass out of the category of orders and will become a sale or charge against the customer or buyer. If the particular goods or equipment, &c., are to be paid for on the spot, the amount of cash received will be recorded on the left-hand or debit side of the engineer's general cash book, with the date and the customer's name, from where it will be transferred or "posted" to the right-hand or credit side of a sales account opened in the impersonal ledger. But if, as is more likely, the customer has been allowed a period of credit, an entry will be made in the day book, or sales book, and the amount posted therefrom to the debit side of the customer's personal account opened in the sales ledger. At the end of each month, the total of the day book items should be transferred to the credit side of the sales account.

Amounts of cash received from credit customers or debtors will be recorded in the middle or "cash" column on the debit or receipts side of the cash book. These amounts should be posted to the credit side of the particular personal accounts, and if any discount has been allowed by the engineer in respect of payment within a recognised or stipulated period, the amount of such discount should be inserted in the inner or "Discounts" column on the debit side of the cash book—on the same line as the cash item to which it relates—and also posted to the credit side of the customer's account. It is permissible to show cash and discount in one amount, reading "By Cash and Discount," but, generally speaking, it will be found more convenient to show them separately.

Sometimes electrical appliances are unacceptable to customers for one reason or another, and they are returned. As such transactions are not likely to be numerous, they may be entered at the end of the engineer's day book, where a number of pages should be reserved for the purpose. The monthly totals of these items—including all allowances made to customers in lieu of actual returns—will be transferred to the debit side of the sales account, the individual items having been posted to the credit side of the respective personal accounts.

Debtors' accounts should not be permitted to run on month after month, but should be collected at the earliest possible moment. In this connection a good control can be effected by making out a list of sales ledger balances at the close of each month's transactions, and comparing the items with those relating to the previous month. To do this each personal account will have to be balanced, but before ruling off the accounts it will be advisable to prove the accuracy of the ledger as a whole, and this can be done by adding the monthly total of the day book, after deducting the returns and allowances, to the total balances outstanding at the commencement of the month, and deducting from this figure the total cash received from customers during the month and the discounts allowed, the result corresponding with the total of the ledger balances outstanding at the end of the month.

We come now to the purchasing side of the engineer's business. Upon the arrival of appliances, equipment, cables, wire, &c., entries should be made in an inwards book kept in the receiving department, and the details on the delivery notes carefully compared with the copies of the orders retained. As soon as the goods, &c., have been transferred to their allotted places, and the invoices have been received, the transactions should be recorded in the purchases book or bought day book, each entry giving the date of the invoice and the name of the suppliers. By using a purchases book which has been provided with a number of analytical money columns, the purchases can be classified under suitable headings by extending each amount into its respective column. At the close of each month's work, the total of the purchases book should be transferred to the debit side of the purchases account kept in the impersonal ledger, while each item representing the invoiced price will be posted to the credit side of supplier's personal account opened in the purchases or bought ledger. Goods returned by the engineer, also allowances made by suppliers in lieu thereof, may be recorded at the end of the purchases book, each amount corresponding with the credit note received, and posted to the debit side of the ledger account. Instead of transferring the monthly total of the returns outwards and allowances to the credit side of the purchases account, the amount may be deducted from the corresponding monthly total of the purchases before the latter is posted to the debit side.

Cash paid by the engineer in settlement or part settlement of creditors' accounts will be recorded on the credit or payments side of the general cash book from where the amounts will be debited to the personal accounts. To balance the purchases ledger independent of the other ledgers, the monthly total of the purchases (less returns, &c.) should be added to the total balances outstanding at the beginning of the month, and from this will be deducted the total of the cash payments made during the month and the discounts obtained by the engineer, giving the total sum owing to creditors as shown on the list of purchases ledger balances.

The best method of keeping and controlling the petty cash is that known as the "imprest" system. To commence operations by this method, a round sum—such as £5 or £10—should be withdrawn from the bank, this transaction being entered in the "bank" column on the credit side of the general cash book and also on the

debit side of a petty cash book kept for the purpose of analysing expenditure which it is either impossible or undesirable to detail in the cash book proper. Each payment made out of petty cash should be recorded in a "total" column ruled on the credit or expenditure side of the petty cash book, and also extended into a suitably headed classification column. At the end of the month another cheque should be drawn, this time for an amount exactly equal to the total petty expenditure, this amount being also posted from the payments side of the general cash book to the debit side of the petty cash book, thereby showing the original round sum still in hand, or "imprest." Instead of transferring the monthly totals of the expenditure to the debit side of a sundry expenses account, it is better to post the total of each classification column to the debit side of a separate nominal or expenses account bearing the same name.

Management and working expenses which are paid by cheque will be shown in the "bank" column on the credit side of the general cash book, and should be posted individually to their respective accounts kept in the nominal or expenses ledger. Expenditure of a capital nature such as that incurred in the acquisition of assets will have to be debited to suitable accounts opened in the engineer's private ledger, this book being provided with a lock and key to prevent any unauthorised person having access to the accounts.

At the termination of the engineer's financial year, or at any other stock-taking date, the set of books should be balanced and the clerical accuracy of the book-keeping work verified by drawing up a trial balance consisting of all the debit and credit balances. As the essential principle of modern double-entry is that for every entry made on the debit side of one book or account there is a corresponding entry on the credit side of another book or account, and *vice versa*, it follows that, providing no errors have been made in any of the postings or additions during the accounting period under review, the total of all the debit items in the set of books will agree with the total of the credit items. In other words, the total of the debit balances must correspond with that of the credit balances as enumerated on the trial balance or summary.

In addition to proving the accuracy of the book-keeping, the figures on the trial balance can be very conveniently incorporated to constitute a trading account, a profit and loss account, and a balance sheet. The purpose of the trading account is to show the amount of gross profit made during the period, and should be drawn up to show, on the debit side, the value of the engineer's opening stock and the net purchases during the period, and on the credit side the net total of the sales and the value of the closing stock. The amount by which the credit total then exceeds the debit total will represent the gross profit, and this should be transferred to the credit side of a profit and loss account, the purpose of which is to show the amount of net profit realised, or the extent of the net loss sustained.

Grouped under suitable headings on the debit side of the profit and loss account will be the various expenses incurred and charges borne during the period. Before the result can be ascertained, it will be necessary to write off adequate depreciation in the value of the wasting assets employed, including boilers, turbines, dynamos, motors, machines, tools, &c. This may be done by charging against the periodical profits a proportion of the first or original cost of the assets, or by subjecting the assets to a new valuation by an acknowledged expert. In the case of the electrical engineer in business on his own account, the credit balance of the profit and loss account—representing the net profit made during the period—may be either added to the balance of his capital account and the amount retained in the business as additional working capital, or credited to his current account to be withdrawn for private purposes as and when required. In the case of a partnership, however, the amount of net profit will have to be shared between the partners in accordance with the deeds or other agreements, each partner's account being credited with the proper proportion, while if the business has been converted into a limited liability company, the trading profit must be kept distinct from the share capital by transferring the balance of the profit and loss account to the credit side of an appropriation account against which will be debited the dividends paid out to the shareholders, the sum transferred to reserve, &c., any balance then remaining being carried forward to the next financial period.

When the figures incorporated in the trading account and the profit and loss account have been approved and passed the remaining items enumerated on the trial balance will be summarised in the form of a balance sheet, the credit balances or liabilities being shown under their respective headings on the left-hand side, and the different assets on the right-hand side. As a rule the assets of a limited company are set down in the order of their permanence, but in other cases it is better to show them in the order of their convertibility, *i.e.*, according to the readiness with which they could be converted into actual cash, if necessary.

The products of the engineer engaged in the manufacture of electrical apparatus are usually of two kinds, *viz.*, products of standard design, and these of special design. Materials used in the assembly, consisting of manufactured parts issued on requisition, may be priced out at standard prices for costing purposes. When an order has been checked, an assembly order should be made out, together with a parts list for obtaining from the assembly department all the necessary parts. By keeping a cost ledger containing accounts of the raw materials, work in process, finished parts, wages, and overhead expenses, the figures may be readily reconciled with those recorded in the financial books.

Reviews.

The A.B.C. of Television, or Seeing by Radio. By R. F. YATES, M.I.R.E. Pp. viii+210; figs. 78. London: Chapman & Hall, Ltd. Price 10s. 6d. net.

This book represents a praiseworthy attempt to present in a convenient form both a simplified technical outline of the progress achieved in television to a recent date, and also information in fair detail that may serve an experienced amateur in assembling an experimental television receiver with at least fair success, and having regard to such objectives, the book can rightly claim a fair measure of success.

Some early developments are mentioned (Chapter I), the limiting restrictions in the present stage of development admitted, and a slightly interesting prophecy follows.

Fundamental principles of television systems are outlined (Chapter II) together with working principles of transmission and reception, including scanning disks and the scanning beam, followed by a brief description of the use of photo-electric cells and in more detail the simple neon lamp with its limitations, the more promising cathode ray, with its increased sensitivity, and then the reader is turned away to matters of speculative utility, namely, the recording of picture signals on wax records and the reproduction of pictures from them.

Photo-telegraphy is described in considerable detail (Chapter III), including transmission both by wire and radio, the interesting Kerr cell light control, vibrating mirrors and their concomitant inertia, various transmission systems including the Cooley with its corona discharge, the simpler "start-stop," the Bell and the "dot and dash"; and then (Chapter IV) to the photo-electric cell is reverted to, and a clear and concise description of its performance with curves and working conditions is given, as well as much useful data, even to their construction by the (intrepid) amateur.

The important subject of l.f. amplification is carefully discussed (Chapter V) together with the serious effects of vibration and interaction and their elimination; followed by extensive extracts from a technical paper dealing with research on the characteristics of l.f. amplification as applied to television, which shows the importance of removing or balancing the d.c. component, and finally (p. 132) a suitable l.f. amplifier circuit is given.

The neon lamp is then described (Chapter VI), with details of its application and general methods of connection in the anode circuit, and after this is recounted (Chapter VII) the earlier use of selenium, wih detailed instructions for the construction of selenium cells.

The problem of scanning is next dealt with (Chapter VIII) and clear instructions are given for forming a simple yet effective scanning disk for amateur use, also an outline of more accurate (and elaborate) means that have been used, continuing by reverting to the simpler disk with details of

a drilling jig; while Chapter IX discusses in detail the difficulties of synchronisation with particulars of some of the methods that have been employed, but without mentioning the simple stroboscopic method.

The final two chapters give fairly detailed instructions for setting up both a transmitter and receiver for home use.

The book as a whole deals with an interesting subject in a useful and simple, although incomplete, manner; while the illustrations are both numerous and good, the diagrams clear, as are the sketches, but some of the latter are poor in their order of arrangement. There is but little space given to the use of the cathode ray, which several authorities familiar with the problem consider has alone the required rapidity of functioning, and with which Dr. Dauvillier has done much work and obtained patents for the polychrome process, and by both infra-red and ultra-violet rays. The book under review contains a few errors of omission, such as on page 86 and in the first sentence of page 140, and several American expressions such as on pages 22, 36, 46 and elsewhere, the book furnishes a lucid description of simple television apparatus and, in view of the widening interest and increasing broadcast facilities, both in this country and abroad, is well worth a place on the shelf of the experimentally inclined radio amateur and anyone interested in this subject.

First Year Electrical Engineering. By D. J. BOLTON, M.Sc., M.I.E.E. 7½ in.×5 in.×¾ in. Pp. xi+260; figs. 118. London: Edward Arnold & Co. Price 5s. net.

The days have passed when the first year student in an electrical engineering college had to spend much of his time studying what was termed "magnetism and electricity," or, perhaps, in an endeavour on the part of those responsible for the curriculum to assess the relative importance of the two parts of the subject of "electricity and magnetism," but the difference applied only to the title and what was taught represented the pure science which underlay the more practical "electrotechnics" which the student would reach in his second year. To-day, it is recognised that, while a knowledge of the theories of electric and magnetic science is essential to an intelligent appreciation of the elementary principles of electrical engineering, there are many parts of the science as previously taught which are of but little value to the practical student of electrical engineering as distinguished from the student who hopes to specialise in design or to take up research, and as a consequence the curriculum of the first year student has taken a far more practical form, and much of the pure theory has been eliminated. As an illustration of this modern tendency, it is only necessary to mention the extent to which electrostatics, the rubbing of glass rods with flannel, experiments with gold leaf electroscopes, and so on formed the subject of study of a previous generation of electrical engineering students. Comparing this with the attention paid to these parts of electrical science to-day, the modern tendency will be at once understood.

In the book which lies before us, the author has endeavoured to cover a course suitable for first year students in electrical engineering at a day technical school, and while he has, to a certain extent, broken away from the traditions of the past he still gives, we venture to assert, too much prominence to the theoretical side of his subject, while neglecting what should be regarded as the essential parts of a first year student's knowledge of practical electrical engineering. Criticism might also be raised against the arrangement of the contents of the book, particularly if the conscientious student is persuaded by his lecturer to work systematically through it chapter by chapter. We rejoice to notice that the author, having divided his subject matter into five sections, starts off with the study of the electric current, and we are pleased to find that he uses throughout the symbols given in the British Engineering Standards Association glossary. This part of the book is very well written and great care has obviously been exercised in the choice of examples on such problems as work, energy, and power, these being of a thoroughly practical nature. But it is difficult to justify the placing of the section of electro-chemistry second, with its lengthy description of the various types of primary cell, although electrolysis and secondary cells which are necessarily included in this section are of practical importance. The third section deals ith magnetism and comprises three chapters, *viz.*, one on natural magnets, one on electro-magnets, and one on motors and generators. Unfortunately, despite the importance of these machines to the electrical engineer they do not received any further treatment, and the student at the end of his first year, if he depends on this book alone, would know practically nothing about dynamos, alternators, and d.c. and a.c. motors. We certainly think that to justify its title this part of the subject demands considerable amplification, even if other parts have to be drastically cut. What tends to emphasise this failure to deal adequately with so important a subject is that, after a short section on electrostatics, the author concludes with a section entitled "Applications," in which, among other things, instruments, illumination, and telephony are dealt with, but in which the vast subject of electric power, either production or utilisation, is not mentioned.

We willingly pay a tribute to the able manner in which the author has dealt with the subjects he has chosen to include in his book, to the care which he has exercised in the choice of his numerical exercises, and to the commendably low price at which he offers it the public, but we feel that, for a book claiming to meet the requirements of even first year students of electrical engineering, its failure to deal in an elementary manner with so important a subject as electric power production, distribution, and utilisation detracts considerably from its value. Even from the historical point of view it fails in this respect, for, whereas a brief but interesting history of current electricity, magnetism, and so on is included at the beginning of the respective sections, no mention is made of the historical discoveries which led to the invention of the dynamo and the motor. The book posesses distinct merits from the students' point of view, but it hardly justifies its title as an elementary text book of electrical engineering.

High-Voltage Cables: Theory and Practice of their Design and Operation. By P. DUNSHEATH, O.B.E., M.A. (Cantab.); B.Sc. (Eng., Lond.), M.I.E.E. Pp. xii+161; figs. 117. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d. net.

This book is based on a course of lectures delivered by Mr. Dunsheath at University College, London, the object of which was "to summarise the accumulated mass of information and make it conveniently available for the many engineers and students who cannot hope to see all the original published literature" on high voltage cable technique.

After a short review of the economic and technical considerations which have led to the demand for high-voltage cables, the author deals briefly, but lucidly, with fundamental principles of dielectrics, describes and analyses the V curve, and explains the methods used in cable factories for the measurement of dielectric loss.

The theory of breakdown is dealt with under the headings: (1) Breakdown on stress; (2) Pyro-electric effects; (3) Mechanical movement; (4) Structural imperfections. Each theory in turn is described as fully as is practicable in such a short space.

In the next chapter the design and manufacture of high-voltage cables of the three-core belted, screened, and S.L. types are described, and their relative conditions discussed.

Single-core cables are the subject of the next chapter, and sheath effects and the measurement of sheath losses are considered.

The heating of cables, its causes, measurement, and effect are dealt with under the headings: (1) I^2R loss in the conductor; (2) Dielectric loss; (3) Sheath and armouring losses; and this chapter terminates with a section on quality, assessment, and stability.

A well-illustrated chapter is devoted to jointing, and last, but certainly not least, there are descriptions of various special designs of cable, including the 132-kV single-core, oil-filled cables installed in New York and Chicago, and a 70-kV 3-core cable for an Italian scheme which was described in the ELECTRICAL REVIEW, Vol. 101, page 622 (1927).

The principal difficulty which faces the author of such a book as this (we quote from the preface) is that the subject "is in such a state of flux, and the development of both theoretical conceptions and practical designs so rapid, that the attainment of finality in the printed record is not easy." Mr. Dunsheath has met this difficulty, as he set out to do, with the finger "pointed in the direction of future development in those cases where the probability is already evident." For example, he points out (page 51) that the explanation of the V curve of dielectric losses has by no means arrived at a final state. On page 68 he says that the mechanism of breakdown in a cable dielectric is complicated and little understood, and that theories are, generally speaking, tentative and incomplete. Then on pages 108 and 109, though the author's opinion appears to be that belted cable should be used up to a pressure of 22,000 volts, metallised core, three-core type, from 22,000 to 33,000 volts, and single core cables above the latter voltage, he states that there are a few engineers who still advocate making the belted type up to 33,000 volts, and the reader is left wondering whether the metallised core cable is only a passing phase, and whether in a few years' time the type will disappear.

It is a disappointment to the present writer that the section headed "Quality Assessment and Stability" is confined to two short pages. Surely this is a subject which is most important to the "many engineers" for whom this book is specifically written. The user of cables is generally quite content to leave design and manufacture entirely in the hands of the cable maker, but he does want some proof that the finished article is going to stand up in service. It is certainly disconcerting to learn that it is a risky proceeding to lay out, and pick up again, a length of high-voltage cable for testing purposes within the precincts and under the supervision of experts of a cable factory.

To one who only occasionally has to deal with cable problems, it is always a puzzle why cable manufacturers cannot adopt some international standard of nomenclature. Chapter 10 is a fine example of the present-day confusion. It is very hard for one used to English units to visualise 95 sq. mm. cable with a thickness of insulation of 0.4 in. and compare it with 500,000 cir. mils with insulation thickness of .94 in.

The book measures .24 yd. by 14.5 cm., and has an equivalent cross sectional area (vertically) of 4.32 sq. in. and (horizontally) 3,650,000 cm. It is particularly well illustrated, and the references which are given to publications on the subject dealt with in each chapter will help readers to pursue their studies further.

Mr. Dunsheath has, in our opinion, most successfully achieved his object. We have read the book with the greatest interest and instruction, and can thoroughly recommend it.

An Illuminated Fountain at Bournemouth.

An Installation Providing Wonderful Colour Effects and Possessing Several Novel Features.

WE reproduce herewith a photograph sent us by W. T. Henley's Telegraph Works Co., Ltd., of the illuminated fountain in the grounds of the New Pavilion, Bournemouth. The design was produced by the British Thomson-Houston Co., Ltd., whose coloured floodlighting equipment is employed in the illumination of the structure and the fountain was supplied through the Edison Swan Electric Co., Ltd. The fountain stands in the centre of an irregularly-shaped pool, which is approximately 150 ft. long and 50 ft. wide. The centre basin is nearly 9 ft. high and 14 ft. across. There are remote push button controls in the Pavilion, in addition to full controls in a chamber in the centre of the structure and immediately under the shallow centre basin. Housed in this chamber are a 7½-h.p. 3-phase motor to operate the four smaller fountains and fill the centre basin, and a 10-h.p. 3-phase motor, which operates the jets in the centre main basin. Turbo pumps of Mather & Platt manufacture are connected to these motors. A special switchboard was built up on the site by Messrs. Aish & Co., Bournemouth, who carried out the installation. The switchgear is by the Midland Electric Manufacturing Co., Ltd., and the controls are B.T.H. and Igranic. In the centre of the chamber are five waterways, each of which is controlled by a magnetic valve, the valves being operated by an automatic flasher of special design, which governs the water effects and colourings. The heating of the chamber is automatically regulated by a thermostatic switch controlling a "Morganite" heater, and an electric fan is also installed. The illumination is so arranged that there are 72 changes of colour and various colour combinations every ten minutes. Installed in the centre of the structure are thirty 1,000-W projector lamps with five different coloured glass screens, and each of the four smaller fountains in the pool is equipped with a 1,000-W projector lamp and a coloured glass screen as a centre. The bronze rim around the large centre basin contains 120 60-W green glass lamps. The colours of the four small fountains in the pool are constant—red, blue, amber, and green. With the exception of the natural green lights under the bronze rim of the centre basin, which are projected downwards to the water in the pool, all the lights are projected upwards into the sprays. All the projectors are of the submersible type, and the lamps are water cooled. Two thousand yards of "Henley" c.t.s. 600-megohm C.M.A. grade cable was used for the wiring of the fountain. The main cables are also Henley's. All the main cables are run in an earthenware duct from a remote control board in the Pavilion, the duct running under the water to the chamber underneath the centre fountain. The main cables are taken to the main switch in the chamber, thence through distributor boards to

Effective Fountain Illumination at Bournemouth.

five specially-designed 6-way, watertight distributing glands in the ceiling of the chambers. From each gland cab tire tails are taken off to the multi-coloured lamps.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Our Issues of December 20th and 27th.

Owing to the Christmas holidays it is necessary that all editorial matter for the ELECTRICAL REVIEW of December 20th and 27th shall be received by us some time earlier than usual.

"Electrical Review" Index.

The Index to Vol. CV (for the half year ending December 31st, 1929) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.

The E.T.B.I. Competition.

Capt. J. T. Keeping, the secretary of the Electrical Trades Benevolent Institution, has sent us a list of prizes and prize-winners in the "cable" competition recently organised by the Institution. The first ten prizes and their winners were as follows:—

Portable "Screen-grid 4" wireless set (presented by the General Electric Co., Ltd.), won by Mr. G. J. Steer, Luton, Beds.; a 3-stage wireless set (British Thomson-Houston Co., Ltd.), Mrs. N. Baker, Stockwell, S.W.; a "Cosyglo" electric fire (Siemens Electric Lamps & Supplies Ltd.), Mr. N. W. Riley, Manchester; a two-stage wireless set (British Thomson-Houston Co., Ltd.), Miss M. Savage, Wallington; electric fire (Arora Co.), Miss Jones, Harrow; camera (Houghton-Butcher (Gt. Britain), Ltd.), Mr. D. K. B. McGregor, Wembley; floor standard and shade (Messrs. Young and Wildsmith), Miss H. M. David, Cardiff; electric radiator (Edison Swan Electric Co., Ltd.), Mr. W. H. Tranmer, Reading; "Bandy" 10-inch fan (Messrs. Berkeley & Young, Ltd.), Mr. P. M. Plucknett, Wood Vale, N.; loud speaker (Mullard Wireless Service Co., Ltd.), Mr. H. J. Yarwood, Moseley, Birmingham. The pewter rose bowl presented by Mr. Justus Eck, for selling the winning ticket was won by Mr. L. E. F. Baenziger, St. Albans. There were many other prizes presented by electrical and other companies.

The Burnley Transport Post.

Regarding the suggested advertisement for a new transport manager to Burnley Corporation, Coun. Broadley, at a Town Council meeting on December 5th, said that no man would come to Burnley to reorganise the system at a salary of £550 rising to £600. He believed they had men in Burnley capable of filling the post. Ald. Buchanan said they must have a manager to control traffic. It would be a mistake to overload one official with too many duties. Mr. Hartley suggested a manager for trams and another for 'buses. Mr. T. P. Taylor mentioned that their 'bus traffic had been losing

£5,000 a year. He believed they must have one manager of both trams and omnibuses, for the latter would some day supplant the tramcars. The Committee's minutes were approved.

Registered Electrical Contractors.

Applications from the following for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting :—

Firth, J., Manchester.
Gaskell & Garraway, Ltd., Taunton.
Wilkinson's Wireless & Electrical Co., Lytham.
Penrose & Son, Plymouth.
Swift, T. W., Selby, Yorks.
Maclean, K., Chorlton-cum-Hardy, Manchester.
Burton, W. H., Chesterfield.
King, H. H., & Co., Longsight, Manchester.
Podmore, W. H., Wolverhampton.
Hammond, C. W., Plymouth.
Lowrey, A. S., Newcastle-on-Tyne.
Fear, E. J., Cheltenham.
Hill, W. F., Dalston, E.8.
Wyeside Welding & Battery Service Co., Hereford.
Thomas Lewis & Sons, Ltd., Aberystwyth.
Darby, G. A., Birmingham.
Watson & Sons, Oldbury.

At the same meeting one application was withdrawn, and seven were declined.

An Architectural Association Bureau.

In August, 1928, the Architectural Association opened a Building Materials Bureau, primarily with a view to providing a series of actual samples which could be used to illustrate lectures to students of architecture at the Association's schools. The use of the Bureau has since been extended to members of the Association to enable them to trace any particular building material they may require, and to keep in touch with new developments. The latest addition to the Bureau is an electrical section where various types of switches, lamps, wiring systems, &c., are displayed. In addition, there is a very complete reference library of manufacturers' products in every sphere, and advice is given to architects as to the type of material, &c., required for a particular job.

New G.E.C. Works in Australia.

The *Sydney Morning Herald*, dated October 26th, reported a speech by Sir William Noble, a director of the General Electric Co., Ltd., regarding the establishment of a telephone apparatus factory in Sydney. He said that he was following the advice of Sir Hugo Hirst in going to Australia to study conditions at first hand. In establishing a factory the company had to pay due regard to the limitations of the Australian market. It would not pay them to turn out the large equipment now manufactured in England by mass-production methods. Their proposal was to manufacture the smaller types of telephone and electrical plant until the further development of the enterprise was justified by the corresponding development of the Commonwealth. Sir William announced his intention of visiting New Zealand.

German Cable Combine.

The registration is reported to have taken place in Berlin of the "Indeska," a community of interests of the "special" cable works. The object is to promote the common interests of the members, and the establishment or acquisition of wire and cable works, &c., particularly the foundation of works abroad. The nominal share capital is 500,000 marks.

The American Position.

Dealing with current events in the United States, the New York correspondent of *The Times* says that in spite of pledges of large industries to expand operations, unemployment is steadily increasing. The motor-car industry last month reduced production to about 40 per cent. of the average of the previous 10 months, but work has begun on new models, and December may show a small increase over November. Some manufacturers are frankly admitting that saturation point has been reached in the automobile industry, which this year increased production by 25 per cent., as against a five-year average annual increase of only 2 per cent. The Ford Company has increased uneasiness in the industry by its announcement that it is expecting the biggest production in its history, and that in a few days it will re-employ all men temporarily laid off at its plant. This is taken in some quarters as substantiating the report, often circulated, that the Ford Company is about to put out a six-cylinder car, and so compete even more intensively with the Chevrolet and other low-priced cars.

The Australian Customs Tariff.

The *Board of Trade Journal* for December 5th contains a statement of the principal alterations in Australian import duties which came into operation on November 22nd. Radio apparatus, which was formerly subject to a duty of 35 per cent. *ad valorem* under the British preferential tariff and 55 per cent. under the general tariff, is now subject to a series of specific duties. The duty on sets, excluding accessories, is 20s. per valve-holder under the British preferential tariff and 30s. under the general tariff; on complete sets the old *ad valorem* duty remains in force. The new duties on ironclad air-break switches and switch-fuses, up to 100A are 3s. each, or 45 per cent. *ad valorem*, under the British preferential tariff, and 5s., or 60 per cent., under the general tariff.

New Swiss Company.

The Volta Gesellschaft für Elektrische und Industrielle Unternehmungen is the name of a concern which has recently been formed in Zurich (28a, Bahnhofstrasse) to finance electrical undertakings.

Uruguayan Duties on Radio Apparatus.

A Bill has been prepared for submission to the Uruguayan Congress for additional import duties on radio apparatus. The proposals include an additional 30 per cent. upon the official valuations applying to radio-telephonic apparatus and radio receiving-sets, excluding valves and loud-speakers; and an additional 20 per cent. upon the official valuations applying to valves. At present the import duty on radio apparatus is 31 per cent., plus a surtax of 14 per cent.—*Reuter's Trade Service* (Montevideo).

Bankruptcy Proceedings.

C. W. SANDS, High Street, Kings Langley, Herts, electrical and wireless contractor.—The public examinatiton of this debtor was held on November 27th, at the Court House, St. Albans, when a statement of affairs was filed showing ranking liabilities of £369, against assets estimated to produce £105, leaving a deficiency of £264. The debtor attributed his failure to lack of capital, keen competition, law costs of suing creditors, and household and personal expenses in excess of profits. In May, 1926, while owing £95 for law costs, he purchased a retail wireless business for £50. In 1927 he added to his business that of an electrician. He was fairly successful, and the business provided him with a living until about eighteen months ago, but since then, owing to local competition, he had experienced difficulty in meeting accounts as they became due. He had been drawing about £3 a week out of the business. He stated that he became aware of his position in October, 1928. The hearing was adjourned.

E. E. PEACE, rear of 230, High Street, Erdington, Birmingham, trading as Peace & Co., manufacturing electrical engineer.—The first meeting of creditors was held on December 4th, at the Official Receiver's office, 191, Corporation Street, Birmingham, when a statement of affairs was produced showing ranking liabilities of £1,090, and a deficiency of £929. The debtor attributed his failure to bad trade, loss on experimental work, and bad debts. In 1923 he entered into partnership with another, putting £200 into the business. It was not successful, and in 1926 a composition of 10s. in the £ was paid. The money was advanced by a relative of the debtor's. The debtor took over the assets of the business, and carried it on under the name of Peace & Co., but he was not successful, and had only been able to continue by creating an overdraft at the bank and by borrowing. The matter was left in the hands of the Official Receiver as trustee.

H. A. LANGLOIS, trading with another as The London Electrical Co., 119, St. Mary Street, Cardiff, formerly 124, Queen Street, Cardiff, electrical engineer.—This debtor's application for discharge was heard on December 3rd at the Law Courts, Cardiff. The receiving order was made in 1926. It was reported that the debtor commenced trading on his own account in 1921 as an electrician, and in 1926 he was joined by another, but the business only lasted seven months. The concern got into debt to the extent of £1,024. It was stated that the debtor consented to judgment for £150, £50 to be paid immediately, and the balance within eighteen months. His Honour granted the discharge.

R. R. WRIGHT, trading as "Wright Bros.," 36, Normanton Road, Derby, wireless dealer.—The public examination herein was held recently at the Court House, Derby, when a statement of affairs was returned showing liabilities of £243, against assets of £146, leaving a deficiency of £97. The debtor and a relative commenced trading in November, 1924, each contributing £30 capital, and a sum of money was borrowed from their parents and put into the business. In 1925 the relative withdrew, but received no payment. The failure was attributed to depreciation of stock, want of capital, and pressure by a creditor. The examination was closed.

V. H. BATES, trading as "The Linton Radio Service," High Street, Linton, Cambs., wireless engineer.—The first meeting of creditors was held recently at the Official Receiver's Office, 41, Sidney Street, Cambridge, when a statement of affairs was filed showing liabilities ranking at £204 against assets of £56, leaving a deficiency of £148. The debtor attributed his failure to the cost of erecting a workshop, repairs of machinery, and drawings in excess of profits made. The matter was left in the hands of the Official Receiver as trustee.

A. J. COLES, Pinner Road, Harrow, electrical engineer and contractor.—The receiving order herein was made on the debtor's own petition. The first meeting of creditors was held recently at 29, Russell Square, W.C.1, when a statement of affairs was filed showing liabilities of £223, and assets estimated to produce £45, leaving a deficiency of £178.

J. W. TURTON, electrical engineer, Market Place, Banbury.—Last day for proofs for dividend, December 23rd. Trustee, Mr. G. Mallam, Official Receiver, 37, Cornmarket Street, Oxford.

B. SMITH (H. Worton), electrical engineer, 43, Stonegate, Spalding.—Last day for proofs for dividend, December 19th. Trustee, Mr. C. E. Turton, 4 and 6, West Street, Boston.

A. SANDGROUND, wireless factor, 32, Allerton Road, Lordship Park, N.—Bankrupt discharged, subject to consenting to judgment for £40.

M. KELLY, radio apparatus dealer, 12, Jackson's Row, Manchester.—Bankrupt's discharge refused, with liberty to file a fresh application after the expiration of two years.

N. H. WOOD, electrical engineer, late of 38, St. Charles Square, N. Kensington, W.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released November 22nd.

S. H. SKIPPER (S. H. Skipper & Co.), electrical engineer, 35, Broad Bridge Street, Peterborough.—First and final dividend of 1s. in the £, payable at the Official Receiver's office, 41, Sidney Street, Cambridge.

Company Liquidations.

PAGE ELECTRICAL EQUIPMENTS, LTD.—A meeting of members is called for January 15th at the offices of Messrs. Corfield and Cripwell, 12, Cherry Street, Birmingham, to hear an account of the winding up from the liquidator, Mr. W. Hand.

ROBINSON & HANDS ELECTRICAL CO., LTD.—A meeting of members is called for January 8th at the offices of Messrs. Poppleton & Appleby, Corporation Street, Birmingham, to hear an account of the winding up from the Liquidators, Messrs. G. W. Sparrow and Mr. F. E. Bendall.

MANCHESTER PRIVATE TELEPHONE & ELECTRIC LIGHTING CO., LTD.—First meeting of creditors and contributors December 13th, at the Official Receiver's offices, Byrom Street, Manchester.

CECIL HODGES & CO., LTD.—Last day for proofs for diivdend, December 17th. Liquidator, Mr. W. A. J. Osborne, 119, Finsbury Pavement, E.C.

DIONOID BATTERY CO., LTD.—Winding up voluntarily. Liquidator, Mr. B. C. Davies, 6, East Parade, Sheffield.

Dissolution of Partnership.

THE FALKSLEY COMPANY, electrical engineers, Great Hall Street, Derby Road, Nottingham.—Messrs. J. W. Lewsley, F V. Howitt and M. Copestake have dissolved partnership. Debts will be attended to by Messrs. Howitt and Copestake.

Trade Announcements.

Messrs. TAYLOR & PARSONS, LTD., Bond Street and Aldermansbury, Bradford, opened new showrooms last week.

Mr. FREDERICK J. WEBB, electrical and wireless engineer, Barrack Square, Chelmsford, has extended his business and opened a shop in Anchor Street; he asks for catalogues, window displays, &c.

The ELECTRO-DYNAMIC CONSTRUCTION CO., LTD., has appointed Mr. G. H. W. Gasper, 48, Palatine Buildings, Victoria Street, Manchester, Messrs. G. W. Mayle & Co., 134, St. Vincent Street, Glasgow, and Mr. D. Baldwin, 69, Albion Street, Leeds, as agents for Lancashire, Scotland and Yorkshire, respectively.

Messrs. SPICER BROS. recently opened new premises at 138, High Street, Hounslow, including an electrical showroom with a 17-ft. window. The display consists chiefly of lighting fittings.

Book Notices.

"Manual of Electrical Undertakings and Directory of Officials, 1928-29" ("Garke's Manual"). Pp. clxx+2063. London: Electrical Press, Ltd. Price 35s. net.—This very useful work of reference continues to expand as the electrical industries grow. The 32nd edition contains information regarding about 5,500 undertakings—electricity supply and electric traction, electrical manufacturing, telephone concerns, &c.—and the directory of officials occupies 270 pages. The "Progress Section" has been amplified by the inclusion of notes on power stations under construction and sanctioned, while a great deal of extra matter has been included in the "Contractors' Section."

"An Outline of Advertising," by Elwyn O. Hughes (Publicity Manager, National Benzole Products, Ltd.). 162 pp. London: Chapman & Hall. Price 7s. 6d. net.—Few people realise that there is a difference between "publicity" and advertising: the author of this book shows that there is. Briefly, publicity is merely to make a commodity known, while advertising is to make an article *desired*. It is the aim of the author to explain at least the framework of this subtle art, although, we imagine, inspiration plays a large part in successful advertising. Such questions as the various media available, the organising of advertising campaigns, the preparation of "copy" and printing technique are fully discussed, as well as a number of subsidiary matters. Advice on reading is given and a bibliography appears at the end of the book, together with a glossary of technical terms and an index.

"Electric Traction," by A. T. Dover. Second edition. Pp. xx+719; 510 figs. and 8 plates. London: Sir Isaac Pitman and Sons. Price 25s. net.

"Photoelectric Cells," by Dr. N. R. Campbell and D. Ritchie. Pp. vii+209; figs. 41. London: Sir Isaac Pitman and Sons. Price 15s. net.

"The Practice of Electrical Wiring." By D. S. Munro. M.I.E.E. Pp. xi+293; illustrated. London: The Electrical Review, Ltd. Price 4s. 6d. net.

Tube Works Re-opened.

The works of the British Mannesmann Tube Co., at Newport (Mon.) were re-opened last week, after being closed for nine days on account of a labour dispute.

New Catalogues and Lists.

HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, E.15.—A showcard, entitled "The power behind the tone," illustrating Hart batteries, and advocating their use for all wireless circuits.

ELLMAR MOULDINGS, CO., Thimble Mill Lane, Birmingham.—List No. E.4, showing "Ellmar" mouldings in bakelite.

UNITED STEEL COMPANIES, LTD., Sheffield.—A booklet dealing with the production of pig iron at the Workington Iron and Steel Branch of the company. Illustrated.

Messrs. JOSEPH ADAMSON & CO., P.O. Box 4, Hyde, Cheshire.—A well-produced brochure recording the progress of the firm since its formation in 1874. Some excellent illustrations of the company's products and workshops are included.

MARCONI COMPANY, LTD., 210-212, Tottenham Court Road, W.1.—A showcard entitled "The world on the wings of the ether—*via* Marconi Valves," illustrating a winged lady and a Marconi valve mounted on a globe.

TYPERLITE CO., 86, Cannon Street, E.C.4.—A leaflet illustrating model No. 6 "Typerlite" desk standard.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—A December stock list of a.c. and d.c. motors.

A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, S.W.1.—A stock list of the company's a.c. and d.c. motors, domestic appliances, &c.

VICKERS, LTD., Vickers House, Broadway, S.W.1.—A brochure containing lists of companies forming the Vickers group and of their products.

IRON & NICKEL BATTERY CO., LTD., 17-19, Cockspur Street, S.W.1.—A booklet entitled "Storage Batteries as a Shipboard Necessity," with particular reference to "Ionic" all-steel batteries.

ENA ELECTRICAL APPLIANCES, LTD., Ena Works, 30, Church Road, N.1.—A folder advertising "Ena" electric fires. Illustrated and priced.

SANTON, LTD., Newport, Mon.—A number of illustrated and priced leaflets drawing attention to the company's products, including "Santon" water heaters, switches, plugs, &c.

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—An illustrated brochure containing a description of the company's research laboratories at Wembley. Also a folder containing 27 samples of the company's gelatine colour media for stage lighting, with particulars and prices.

ARCTIC FUSE & ELECTRICAL MANUFACTURING CO., LTD., Birtley, Co. Durham.—A folder giving illustrated particulars of "electro-velocity" radiators.

Messrs. W. SISSON & CO., LTD., Elmbridge Road, Gloucester.—A brochure giving brief illustrated details of Sisson engines and photographic views of the company's works.

CONSOLIDATED PNEUMATIC TOOL CO., LTD., Egyptian House, 170, Piccadilly, W.1.—Publication No. S.P.142, dealing with electric and pneumatic scaling equipment. Illustrated.

Messrs. VICKERS-ARMSTRONG, LTD., Vickers House, Broadway, Westminster, S.W.1.—A brochure in English, French, and Spanish, giving brief illustrated particulars of the company's dock equipment.

Messrs. HAGGERTY, LAWRENCE & Co., 237, Mansion House Chambers, Queen Victoria Street, E.C.4.—Leaflet No. 75, describing the Bull "Midget" light arc welder.

Calendar-blotters for December have been received from Messrs. S. ROGERS & CO., LTD., 15, Fitzroy Street, Tottenham Court Road, W.; Messrs. DE BRUNNER & LANG-SIMS, 3 & 4, King Street, W.C.2; JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1; WARREN BROS. (MIDDLESBROUGH), LTD.; and Messrs. MAVOR & COULSON, LTD., 47, Broad Street, Glasgow, S.E.

Calendars and Diaries.

To Mr. CHARLES SELZ, 47-49, New Cavendish Street, W.1, belongs the honour of providing us with our first 1930 diary. This, as usual, is in a neat leatherette case with pockets, has a week to a page, and contains a lot of useful information.

The ASSOCIATION OF ENGINEERING AND SHIPBUILDING DRAUGHTSMEN has again sent us a copy of its diary. This is a handsomely bound little book in which the diary is prefaced by over a hundred pages of technical data and general information.

A calendar for 1930 received from Messrs. ROBERT HORNBY AND CO., LTD., 77, Dean Street, W.1, bears illustrations of the prepayment meters which the company supplies, and a block of large-figured daily slips.

The D.P. BATTERY CO., LTD., Bakewell, Derbyshire, again employs a view of the beautiful Derbyshire country for its calendar. This time it is a pastoral scene in Dovedale.

From the DUSSEK BITUMEN CO., LTD., of Sherman Street, Bromley-by-Bow, E.5, we have received one of their choice pocket diaries for 1930.

The Electrical Wholesalers' Dinner.

The annual dinner of the Electrical Wholesalers' Federation will take place on February 13th, 1930, at the Savoy Hotel, London. Sir Hugo Hirst, Bart., will be the chief guest, and it is expected that the Minister of Transport, and Mr. G. E. Cullinan (Graybar Electric Co., New York), the president of the National Electric Wholesalers' Association of America, will

also be present. Rationalisation, it is suggested, will form the topic of the speeches. As a large gathering is expected, the secretary, Mr. James W. McKay (19-21, Hatton Garden, E.C.1), asks firms and others interested to make early application for tickets (15s. each). For the information of friends from a distance there is the inducement of railway vouchers for return tickets at single fare and a third.

For Sale.

The Disposals Committee of the North-East Coast Exhibition, Newcastle-on-Tyne, invites offers for a large quantity of electrical apparatus. (See our advertisement pages to-day.)

Recent Contracts.

Messrs. CLOUGH, SMITH & Co., LTD., have received instructions to proceed with the overhead electrical equipment of a further extension to the Darlington Corporation trolley omnibus system. This is the second repeat order placed with Clough, Smith & Co., Ltd., since the tramway system was converted by them and put into service for the operation of trolley vehicles in December, 1925. The construction of extensions to the system in Willow Road and Neasham Road were equipped and opened for service in March and April of last year. The route at present under construction is from the Market Hall to Geneva Road West, and it will form the sixth extension to the original tramway system.

The SIEMENS & GENERAL ELECTRIC RAILWAY SIGNAL CO., LTD., has been awarded a contract for the power signalling installation in connection with the electrification of the Madras suburban services of the South Indian Railway. The work comprises the supply and erection of the necessary apparatus to provide automatic signalling between Madras Egmore station and Tambaram, a distance of approximately 18 miles of double-line electrified track. The apparatus will be a.c. throughout, using colour-light signals fitted with the "S.G.E. Osram" double safety signal lamp. Continuous a.c. track circuits will be provided employing the "S.G.E." auto-bond. The equipment involved includes the following:—274 impedance bonds; 600 a.c. track and line relays; 100 multiple secondary track transformers; 180 colour-light signals (2 and 3 aspect) with necessary poles and fittings; 160 apparatus cupboards, &c., all of which will be manufactured in England in the company's associated works. The cable will be "Permanite" insulated and armoured, and will be manufactured by Siemens Bros. & Co., at their Woolwich works.

British Engineers' Association.

At the monthly luncheon meeting of the British Engineers' Association held yesterday, December 12th, at St. Ermin's Restaurant, Sir LYNDEN MACASSEY, K.B.E., K.C., was to speak on "The State and Industry."

An Echo of the General Strike.

During the general strike of May, 1926, the Hull Corporation tramway services were maintained with the assistance of volunteers. A number of these (113) were retained in the Corporation's service, and it was recently stated that their retention was a source of friction and discontent in the department. It was accordingly proposed that they should be discharged with the option of being re-engaged in the lowest positions. In spite of strenuous opposition to this measure the City Council approved it at a recent meeting, and the men concerned have been given notice terminating their employment.

Henley's Dramatic Club.

On Monday next, December 16th, at 8 p.m., at the Cripplegate Theatre, Golden Lane, E.C., Henley's Dramatic Club will present John Galsworthy's "The Skin Game."

Unemployment.

There was an increase of 11,969 in the number of persons on the registers of the Employment Exchanges in Great Britain during the week ended November 25th. At that date there was a total of 1,285,500, as compared with 1,273,531 on November 18th, and 1,395,505 on November 26th, 1928.

Scientific Management.

We have received from the International Management Institute, 154, Route de Lausanne, Geneva, some particulars of its constitution, aims and methods. The Institute is a scientific foundation established in 1927 to provide a clearing house of information regarding scientific management and a means of facilitating contacts between those interested in the subject in various countries. It also organises various special services to assist individuals or firms desirous of studying their problems on modern scientific lines. The organisations concerned in the founding of the Institute were the Twentieth Century Fund, the International Labour Office, and the International Committee for Scientific Management. Membership is divided into two classes: Any international organisation, government, public institution, professional or trade association or union can become a member subject to a minimum annual contribution of 5,000 Swiss francs. Associate membership can be attained by any institution, organisation, undertaking, or persons making a minimum annual contribution of 100 Swiss francs. The Institute has sent us a copy of its monthly bulletin, in which there appear several interesting articles on various aspects of scientific management as applied to a number of industries, as well as a useful bibliography. Accompanying this was a copy of an address by the Director of the Institute (Mr. L Urwick, O.B.E.) on "The Training of the Business Administrator." The Institute welcomes visits from business men and women.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Dec. 10th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton	£80	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£26	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£165	£10 dec.
	Grade II... ... ... ,, ,,	£116	£6 dec.
	Grade III ... ... ,, ,,	£66	£2 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	10½d.	...
c	,, Tubes (solid drawn) ... ,,	1/0½ to 1/1	...
c	,, Wire, basis ... ... ,,	10½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/3	...
g	,, Bars (best selected) ... per ton	£110	...
g	,, Sheet ... ... ,,	£110	...
g	,, Rod ... ... ,,	£110	...
d	,, (Electrolytic) Bars ... ,,	£84	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£90	...
d	,, ,, H.C. Wire per lb.	11¾d.	...
f	Ebonite Rod... ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	8½d.	½d. dec.
i	Iron, Pig (Cleveland No. 3.) ... per ton	72/-	14/- dec.
l	,, Wire, galv. No. 8. P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£22 15s.	...
g	Mercury ... ... per bot.	£23 to £23 5s.	...
e	Mica (in original cases) small ... per lb.	6d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/3½	...
p	,, ,, wire... ... ... ,,	1/6	...
o	Platinum ... ... per oz.	£13 10s.	...
d	Silicium Bronze Wire ... ... per lb.	1/3	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£181 10s. to £182 10s.	£7 15s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	1d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their letter dated December 7th, Messrs. James Forster and Co. stated that the lead market was very quiet last week, with only minor fluctuations. Demand from consumers in this country continues on a hand-to-mouth basis. The Producers' Association is maintaining its price, although December lead is offering on the market at less money. Reports from the Continent, particularly from Germany, continue to be pessimistic, and prompt lead is on offer at under the Association's price. Consumption, particularly for batteries for motor cars, is bound to be affected next year by the collapse on Wall Street, while world production is steadily on the increase.

Municipal Trading at Sydney.

The *Sydney Morning Herald* says that it has been contended by the Electrical Employers' Association that the Sydney (N.S.W.) City Council is unfairly competing with its members in the sale, on time-payment, of electrical appliances. The City Commissioners reply that they have been popularising the use of electrical apparatus by the service offered to householders, and which the electrical traders had not agreed to provide.

In response to representations by the Association, the State Government has announced its intention of appointing a committee to investigate the matter. This committee will consist of one representative each of the City Council, and the Electrical Employers' Association, with a chairman appointed by the Government. It will be the duty of the committee to formulate plans for co-operation between the Council and the traders with a view to the extension of the use of electricity and electrical appliances.

Lighting and Power Notes.

Accrington.—PROPOSED SUPPLY EXTENSIONS.—The Corporation electrical engineer has been instructed to inquire into the cost of extending the electricity supply to Huncoat, and see whether it is possible to obtain a grant from the Unemployment Grants Committee towards the scheme.

Aldershot.—TRANSFER OF UNDERTAKING.—The Parliamentary agents of the Aldershot Gas, Water, and District Lighting Company, have informed the Godalming Town Council of its intention to make application immediately to the Electricity Commissioners for a Special Order sanctioning the transfer to their clients of the Urban Electric Supply Company's undertaking at Godalming. The Aldershot company has for some time been in negotiation for the acquisition of the undertaking, but the Corporation, which has the option of purchasing it, has declined to sanction the Company's proposal.

Argentina.—FARM ELECTRIFICATION.—According to the *Review of the River Plate*, Señor Mauro Herlitzka, president of the Compañia Anglo-Argentina de Electricidad has informed the President that his company has decided to invest a large amount of capital in the country with a view to the supply of electric power over diverse and widespread areas. It is proposed to install h.p. lines for the use of pastoral and agricultural establishments. The company has already placed a line between Cordoba and Villa Maria, and this is soon to be extended to Rosario. Similar long-distance lines are to be installed in different areas of the Republic.

Barnstaple.—ELECTRICITY SCHEME.—The Town Council has applied for sanction to a loan of £4,232 for work in connection with an electricity scheme.

Barrow.—NEW PUMPING PLANT.—The Town Council has decided to install two new submerged centrifugal pumps, each having a capacity of 4,000 gal. per minute, driven by vertical electric motors, at the sewage pumping station at Salthouse at an estimated cost of between £3,000 and £4,000.

Birkenhead.—LOANS.—The Corporation Electricity Committee is to seek sanction to a loan of £21,653 for the provision and installation of a new h.p. switchboard and rotary convertor at the Bentinck Street electricity station.

Sanction has been received to loans of £2,100 for overhead extensions at Saughall Massie and Ledsham; £5,966 for overhead line extensions at Burton and Puddington; and £900 for a supply to Great Sutton.

Blackburn.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £20,000 to provide for future expenditure on electricity mains and services.

Blackpool.—NEW CABLES.—The Corporation is applying for sanction to loans totalling £7,550 for feeder cables.

Bolton.—NEW WATER COOLING PLANT.—The Corporation Electricity Committee has decided to install additional water cooling plant of the sprayer type, capable of dealing with 750,000 gals. per hour, at the Back-o'-th'-Bank generating station.

Bristol.—EXTENSION OF SUPPLY AREA.—The Corporation is applying for sanction to extend its area of electricity supply to include Henbury and Bishopsworth.

Bury.—YEAR'S WORKING.—We have received from Mr. J. G. Potts, engineer and manager of the Corporation Electricity Department, a copy of the accounts together with his report on the working of the undertaking for the year ended March 31st last. The total revenue amounted to £125,693, as compared with £116,899 in the preceding year, while the working expenditure (which included £12,759 contribution to capital) totalled £83,561, as against £74,068. To the gross profit of £42,132 (£42,831) was added £139 unemployment grant, £1,753 bank interest and £1,357 from sale of plant, making a total of £45,382 available. From this the following items had to be met:—Interest on loans, £18,977; sinking fund contribution, £17,845; bank interest, £534; and transfer to sinking fund, £1,357. There remained a net surplus of £6,669, as against £5,995 in 1927-28. The capital expenditure during the year amounted to £59,694, the principal item of which was £30,561 for plant, machinery, &c., at the Chamber Hall power station. The total now spent on the undertaking stands at £673,055. The electrical energy sold increased from 25,270,672 to 27,232,015 kWh and the maximum supply demanded from 10,840 to 12,320 kW. The average price obtained per kWh fell from 1.067d. to 1.060d. Satisfactory progress has been made with the extensions to the power station plant and it is anticipated that the installation of the new 10,000-kW turbo-alternator and boiler plant will be completed in time for next winter's load.

Canada.—HYDRO-ELECTRICAL PROGRESS.—In October the Canadian Hydro-Electric Corporation, Ltd., produced 208,661,000 kWh of electrical energy, which is 39 per cent. above the output for October of last year, and 20 per cent. above the figure for September. The output of the Corporation for the twelve months ended October 31st was 2,002,406,000 kWh, an increase of 75 per cent. as compared with the output for the corresponding period of 1927-28.

Continental.—SWEDEN.—The Waterfall Board (Vattenfallstyrelsen) is asking the Government to propose to the next Riksdag the construction of a hydro-electric power station at Vargoen on the Goeta river, on which the big Government-owned Trollhaettan power station is situated. The cost of the new station is estimated at Kr. 9,400,000. With a fall of 3.3 metres, the output will be 85,000,000 kWh per annum, but later, after the regulation of Lake Vaener, the source of the Goeta river, has been completed, and the fall increased by one metre, the output will be 115,000,000 kWh.—*Reuter's Trade Service* (Stockholm).

BELGIUM.—In order to meet the increasing demand for electrical energy, a new 10,000-kW turbo-generator set is approaching completion at the power station at Monceau of the Société Intercommunale Belge d'Electricité, and next year two 4,000-h.p. turbo-generators are to be installed. A new 15,000-h.p. turbo-generator set is also being installed at the company's power station at Alost, while orders have been placed for an additional 30,000-h.p. set for the station at Bressoux.

GERMANY.—According to *E.T.Z.*, the output of the 122 principal electric power stations in Germany during August last amounted to 1,435,400,000 kWh, bringing up the total for the first eight months of the year to 10,735,700,000 kWh, as compared with 9,091,300,000 kWh in the corresponding period of 1928.

Dunoon.—ELECTRICITY SUPPLY.—The Provisional Order for the supply of electricity to the town has been passed, and an immediate start will be made with the work. Plans for the erection of the power station have been passed by the Dean of Guild Court and it is expected that the supply will be available next summer.

Eastbourne.—AREA OF SUPPLY.—At a meeting of the Corporation Electricity Committee held recently, the chairman reported his further interview with representatives of the Electricity Commission on the subject of the division of territory in the Eastbourne rural district for the purposes of electricity supply, and a letter was read from the Electricity Commission stating that the promoters of the Ringmer and District Special Order have agreed to withdraw the parishes of Wilmington, Folkington, Jevington, Friston and East Dean from their application. These parishes will, therefore, be included in the Eastbourne Extension Order, and the following parishes will be excluded from it, *viz.*:—Alfriston, Alciston, Berwick, Litlington, Lullington, Selmeston and West Dean.

LOAN.—It was reported that in anticipation of the granting at an early date of the application by the Corporation for a Fringe Order to give a supply to certain premises in East Dean and Friston, the Finance Committee had decided to seek sanction to the borrowing of £11,430.

REVISED TRANSMISSION-LINE ESTIMATES.—At a recent meeting of the Corporation Electricity Committee, the town clerk reported that, in accordance with the Committee's instructions, revised plans and estimates dealing with the substitution of underground for overhead transmission lines had been lodged with the Electricity Commissioners. The total estimated capital expenditure for underground transmission is £11,430, and overhead transmission, £6,800.

ELECTRICITY SUPPLY EXTENSIONS.—The Committee has decided to carry out extensions for a supply of electricity to Lower Willingdon, at an estimated cost of £616.

Erith.—NEW PLANT.—The Urban District Council has applied to the Electricity Commissioners for sanction to expend from the reserve fund, instead of out of a loan, a sum of £3,361 for cable, switchgear and transformers.

Fairlie.—INAUGURATION OF SUPPLY.—The Earl of Glasgow performed the ceremony of switching on the electricity supply for the village on Saturday last. To celebrate the event the principal street of the village was illuminated.

Hebden Bridge.—BULK SUPPLY.—The Urban District Council has approved a draft agreement with the Halifax Corporation for a further bulk supply of electricity.

Heston & Isleworth.—LOANS.—The Urban District Council Electricity Committee is to apply for sanction to loans of £30,989 for l.p. distribution mains, and £2,550 for replacement of consumers' apparatus.

Hull.—ELECTRICITY SUPPLY.—The Corporation Electricity Committee proposes to erect an overhead line from Sutton to Skirlaugh to give a supply of electricity to the Hornsea area. The estimated cost of the scheme, inclusive of provision for a supply to Swine and Skirlaugh, is £15,186. The erection of the overhead line portion of the scheme is to be carried out by the Department's present contractors for overhead lines, Messrs. Watshams, Ltd., of London.

Ilkley.—UNDERTAKING PURCHASE OFFER REJECTED.—The Urban District Council has rejected an offer by the Yorkshire Electric Power Co. to purchase the Council's electricity undertaking, to take over also the obligation of the outstanding loans, and to make an immediate reduction in the charges for electricity.

Lancaster.—ELECTRICITY SUPPLY SCHEME.—The Corporation Electricity Committee has instructed the electrical engineer to prepare a scheme for supplying electricity to Galgate, Halton, Caton, and Brookhouse, with a view to application for an unemployment grant.

Leeds.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to loans of £175,000 for services and £50,000 for assisted wiring.

Lincoln.—EXTENSION OF SUPPLY AREA.—The Corporation Electricity Committee has considered a report of the electrical engineer with respect to a request for a supply of electricity to houses to be erected on Greetwell Road, and recommends that part of the proposed inner h.p. feeder ring from St. Swithin's power station to Brayford be laid as far as Greetwell Road, the estimated cost being £3,800.

Llanelly.—GALE DAMAGE.—According to the *Daily Mail*, the electricity supply was cut off for nearly four hours when a portion of the 120-ft. high stack of the Llanelly and District Electric Supply Co., Ltd., was blown down and fell into the engine room of the power station shortly after 6 p.m. last Sunday.

Llanidloes.—SPECIAL ORDER.—The Llanidloes Electric Light Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the borough of Llanidloes, and certain parishes in the rural district of Newtown and Llanidloes.

London.—PRICE REDUCTION.—The South Metropolitan Electric Light and Power Co., Ltd., has decided, after the December meter readings, to make the following reductions in the charges for electricity in the Greenwich and Crystal Palace districts, including the Blackheath and Lewisham areas:—Lighting, flat rate: From 6d. to 5½d. per kWh. The "unit" charge for "all-in" domestic and business supply two-part tariff: From 1d. to ¾d. per kWh.

The South London Electric Supply Corporation has also made the following reductions in charges:—Lighting flat rate: From 6d. to 5½d. per kWh. The "unit" charge for the "all-in" domestic and business supply two-part tariff: From 1d. to ¾d. per kWh.

STREET LIGHTING.—Lord Byng, Police Commissioner, recently issued a circular letter to all the municipal authorities in London calling for more light in the streets. The letter suggested that many street accidents have been directly due to inadequate lighting arrangements. "Lord Byng's object," an *Evening News* correspondent was told, "was to get the local authorities to co-operate with the police and the Ministry of Transport in promoting public safety."

Macclesfield.—PROPOSED PURCHASE OF UNDERTAKING.—The Town Council has appointed a committee to consider and report as to the purchase of the undertaking of the Electricity Company of Macclesfield, Ltd., and other matters which may arise in connection with the electricity supply within the borough.

Maidstone.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £25,000 for mains and services, and £11,683 for mains, services, and works for the supply to the Malling district.

Manchester. — DOMESTIC TARIFF ALTERATION. — The City Council has adopted a resolution proposed by the Electricity Committee to substitute present ratable value for "pre-war values" in fixing the basic charge for the "all in" tariff for domestic users, subject to an amendment that there should be a reduction in the tariff from 15 per cent. of the ratable value to 12½ per cent.

STREET LIGHTING.—The Council has decided to light the following roads by electricity: Kenmere Grove, Moston Lane; Greenhill Road and Balliol Street, Crumpsall; School Lane, Kingsway and Willoughby Avenue, Didsbury; and Clare Road, Levenshulme.

Oswestry.—PURCHASE OF UNDERTAKING.—The Town Council has decided to purchase the undertaking of the Oswestry Electric Lighting and Power Co., Ltd., for £19,300, and to apply for sanction to a loan of £22,000 in connection therewith.

Plymouth.—NEW PLANT.—The Corporation Electricity Committee has decided to expend the following sums on plant at the Prince's Rock power station:—Turbo-alternator and foundations, £42,500; boilers, chimney, &c., £39,333; feed and circulating pumps, &c., £4,200; circulating water screens and chamber, £3,080; steam and other piping, £4,400; switchgear, £3,713; cables, £900; conveyor, £1,200; and battery room, £1,974.

LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £65,000 for mains and services.

Retford. — RURAL SCHEME SANCTIONED. — The Electricity Commissioners have sanctioned the Town Council's scheme for supplying Tuxford and the rural area with electricity, and the work is to be commenced without delay.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised mains extensions to cost £8,525.

Stafford.—TRANSFER OF UNDERTAKING.—The Town Council has approved proposals for the transfer of the Corporation generating station to the North-West Midlands Joint Electricity Authority for £166,015.

Stoke-on-Trent.—MAINS EXTENSIONS.—The Corporation Electricity Committee has decided to extend mains to the works of Bullers, Ltd., at Milton, at a cost of £3,500; from the Porthill sub-station to the works of Jesshopes, Ltd., at an estimated cost of £1,200; to the factory of Messrs. Beesons, at a cost of £280; and, subject to a satisfactory guarantee being received and to an agreement being entered into with the North West Midlands Joint Electricity Authority, to the colliery of the Eaves Lane Coal and Marl Co., at a cost of £1,000. A sum of £6,500 has also been voted for mains and equipment in connection with the supply to the Springfield Tileries of Wheatley & Co. at Stone Road, Trent Vale.

LOAN.—The Corporation Electricity Committee is to apply for sanction to the borrowing of £5,000 for the changing-over of consumers' apparatus.

SUB-STATION EQUIPMENT.—The Committee has decided to provide and equip a sub-station in the Hanley works, at a cost of £2,000, and to install additional plant at East Fenton and Minton's sub-stations, at a cost of £600.

Tilbury.—LOAN INQUIRY.—An inquiry was held on December 3rd by Col. T. C. Ekin into the application of the Urban District Council for a loan of £44,362 for electricity purposes. The inspector stated that he had gone into the figures and found that the sum really required by the Council was £46,707, and, if so, the Council would have to pass a resolution amending the amount. The inspector criticised the loss on the undertaking, and said that he thought some charge ought to be made for meters. There was no opposition, and it was arranged that the Council should send certain supplementary information regarding the sum required.

Tiverton.—FLOOD DAMAGE.—It is feared that the Corporation's new generating plant, which was started up recently by the Mayoress, has been considerably damaged by flood waters.

Ulverston.—ELECTRICITY SUPPLY PROGRESS.—At a recent meeting of the Urban District Council, it was stated that there was an increase in the consumption of electricity for last month of 39.3 per cent. as compared with November, 1928, and an increase of 30.5 per cent. for the eleven months ended November 31st.

Wakefield.—UNDERTAKING NOT TO BE SOLD.—The City Council at a meeting held recently again considered the offer of the Yorkshire Electric Power Co. to take over the city's electricity undertaking, at the price of £250,000, "plus a substantial sum," which would probably bring the figure nearer £300,000, and to reduce the charges for electricity forthwith. The offer had been declined by a previous meeting, but the matter was raised on the minutes of the General Purposes Committee by further correspondence from the company. Opinion in the Council—especially in view of the fact that Wakefield Corporation has lost some £340,000 in the Hatry companies crash—was so keenly divided that the vote on an amendment to refer the matter back for further negotiations showed 20 on each side. The Mayor declined to give a casting vote, and therefore the amendment failed, and the minute rejecting the offer was approved.

Wimbledon.—NEW PLANT.—To meet the growing demand for electrical energy, the Corporation Electricity Committee has decided to provide a 5,750-kW turbo-alternator with switchgear and auxiliaries.

LOAN SANCTIONED.—The committee has received sanction to a loan of £30,000 for electricity mains and services.

Tramway and Railway Notes.

Brazil.—RAILWAY ELECTRIFICATION.—The Paulista Railway Co. is about to construct five side tracks at its Jundiahy station-yards and extend and partly re-equip the shops at that junction.—*Reuter's Trade Service* (Sao Paulo).

Bury.—EXPERIMENTAL TRAMCAR HEATING.—The Corporation Tramways Committee is experimenting with a system of electric heating of the tramcars. Pipes run along a portion of each side of the car, each containing 250-volt elements in series, the electrical energy being supplied by the overhead wires; where the pipes pass between seats they are covered with a metal grid to protect the feet and ankles of passengers. The enclosure of the elements in a metal pipe, which enables the heat to be retained for a considerable period, even when the electricity has been turned off, and this allows some regulation of the car heating. The tramway manager is experimenting with an alternative system before making his final recommendation to the Tramways Committee for general adoption on all the cars.

Continental.—HUNGARY.—The Hungarian State Railways have invited tenders for the first part of the work of electrifying the Budapest-Hegyeshalom line (the Hungarian section of the Budapest-Vienna line). The total amount involved exceeds 12,000,000 pengoes (about £430,000) of which 2,800,000 pengoes (£100,000) will go to the purchase of electric locomotives.—*Reuter* (Budapest).

ITALY.—At the end of June last 1,012 miles of the Italian State main line railways, representing 1,973 miles of track, had been electrified. At the date mentioned 290 miles of line, representing 426 miles of track, were in course of electrification, while electrification plans were being prepared

in respect of a further 363 miles of line. According to *L'Elettrotecnica*, the consumption of electricity for the operation of the electrified Italian State railways in the fiscal year 1927-28 amounted to 296,700,000 kWh.

Darlington. — RAILLESS-CAR SYSTEM EXTENSION.—At a recent meeting of the Town Council it was decided to proceed as quickly as possible with the projected extension of the railless-car system from the Market Place to Geneva Road by way of Blackwellgate, Grange Road, and Victoria Road.

Gosport.—TRAMWAY ABANDONMENT.—The Gosport and Fareham Tramways Co. has decided to discontinue its tramway service as from January 1st next, and to substitute 'buses.

The Great Western Railway.—PROPOSED ELECTRIFICATION SCHEME.—The Great Western Railway Company is stated to be considering a scheme for the electrification of railways in the Bristol area at a cost of between £1,000,000 and £2,000,000. The lines said to be involved in the proposed scheme are: (*a*) Bristol to Avonmouth, *via* Clifton Down and Shirehampton; (*b*) Bristol to Portishead; and (*c*) Bristol to Weston-super-Mare.

Walsall.—TRAMWAY ABANDONMENT.—The Corporation has prepared a Bill to empower the Corporation to purchase compulsorily or by agreement the part of the tramway of the South Staffordshire Tramways Co. from the boundary between the borough and the urban district of Darlaston to the Bull Stake, Darlaston, and the part of the tramway of the Wednesbury Corporation from the boundary between the borough and the borough of Wednesbury to the "White Horse," Wednesbury, and to empower the Corporation to abandon the tramways connected therewith and to substitute 'buses.

Telegraph and Telephone Notes.

Canada.—TELEPHONE SERVICE.—The Bell Telephone Co. expects, during the next five years, to spend on extensions and replacement 160 million dollars and to install 250,000 telephones in the provinces of Ontario and Quebec, says the *B. of T. Journal*. Since the present operating organisation was established six years ago, its investment in telephone plant in service has grown by more than 106 per cent., the total at present being 144 million dols. The number of telephone stations has increased by 61.4 per cent. to the present total of 739,000; annual additions to plant have grown by 137.3 per cent. to 29 million dols. in 1929, and the number of employés has risen from 12,700 to 19,200, an increase of 61.2 per cent. The general executive headquarters are at Montreal, but in 1930 there will be two independent operating areas, each with its own general manager and complete administrative and engineering staffs. Toronto will be the headquarters of the western area, while Montreal will be the headquarters of the eastern division. The Bell Co., though the largest, is not the only concern controlling telephones in Canada, the number of separate organisations being nearly 2,500, many, of course, operating in very restricted areas.

Radio-telephony.—INTERNATIONAL POLICE SERVICE.—The private broadcasting police "net," which embraces Austria, Germany, Poland, and Czecho-Slovakia has been inaugurated. Hungary is expected to join shortly, and Roumania is co-operating to some extent, while Switzerland and Dantzig also will be included shortly.

The Telephone Service.—POLICE BOXES.—The first network of special police telephone boxes which is being erected throughout the metropolitan police area of 700 square miles recently came into use at Richmond, Kew, and Barnes. All the 22 boxes are connected directly with the divisional police station at Richmond. The telephone, which is contained in a cupboard in the box, can be used by anyone requiring police assistance.

The ordinary instrument has been replaced by a fixed microphone and loud-speaker in the system just installed at Rochdale. The device is based on the supposition that people calling for police assistance are usually agitated, and should be freed from any possible entanglement. The earpiece and cord have therefore been dispensed with, and the opening of the small door giving access to the instrument automatically sets up communication with headquarters.

CARRIER-WAVE SYSTEM.—It is reported that the carrier-wave system of speech transmission is being applied to the Blackpool-Isle of Man submarine telephone cable.

STORM DAMAGE.—Post Office linesmen have been busy during the last two weeks of gales and thunderstorms in South and South-West England. Several hundred trunk and local circuits were interrupted, overhead lines being broken in many cases by falling trees and roof tiles. Telegraph communication between the Channel Isles and the mainland was completely interrupted, no telephone cable being available. Similar stormy conditions have prevailed in France too.

Radio Notes.

Brookman's Park.—SECOND TRANSMITTER.—In addition to the 356.3-metre transmitter, the second transmitter commenced a schedule of test transmissions on December 9th on a wavelength of 261.3 metres, twice daily of half an hour each. If the shorter-wave radiation is of the same power as the longer one attenuation will probably cause the signal to be weaker at a distance. In adjusting receiving sets it should be remembered that the Leeds station is at present working on 200 metres and that about a year hence the separation between Brookman's Park and Daventry (5 GB, 479.2 m.) may be decreased.

During the test programmes the 356.3-m. transmission consisted of speech only, to be readily distinguishable from the new transmitter, which operated for a time without the complication of the presence of the longer-wave radiation. The eventual national, or general interest, service (maximum radius from 50 to 60 miles) will be provided by Brookman's Park (261.3 m.) and Daventry (5XX, 1,554.4 m.), while the Brookman's Park (356.3 m.) radius will be about 80 miles.

Germany.—NEW STATIONS.—Important decisions were reached at a meeting of broadcasting representatives at the Funkhaus in Berlin on November 27th, when it was announced that the reorganisation of the German system had been approved in principle. It is understood that a number of super-stations (seven or eight) will be built to replace the present main stations, which are situated in or near the large towns, after the Langenberg model, in open country. Simultaneously there will be created a parallel system of low-power stations for "single-wave" working. The power of the new stations will probably be 60 kW with the possibility of being raised to 100 kW, which figure is the maximum agreed to at the recent Hague session of the International Consultative Technical Committee. The stations will cost about 16,000,000 marks (£800,000) each. The first two may be about twenty miles distant from both Stuttgart and Frankfurt, and *World-Radio* thinks it is possible that the reorganisation of the system will be finished within two years.

PICTURE TRANSMISSION.—The poor response to an inquiry has led to the decision to terminate the experimental transmission of still pictures from the Berlin stations.

International Broadcasting Union.—RED CROSS MESSAGES.—Representatives of the organisations composing the International Broadcasting Union recently attended a conference at Barcelona, Spain. One of the questions on the agenda was wireless broadcasting in connection with disasters. Red Cross representatives were invited to take part in the discussions, and, in view of the studies it is making for the preparation of the International Relief Union, the secretariat of the League of Nations also took an active part in the proceedings. After receiving the different reports presented on the subject, the Council of the International Broadcasting Union unanimously decided to recommend that broadcasting organisations and Government departments should study and establish agreements with national Red Cross Societies granting special facilities to such societies in respect of their communications, and priority over all broadcasting, in the event of public disasters.—*Reuter's.*

Nickel and its Uses in Engineering.

Lecturing recently before the Junior Institution of Engineers, Mr. W. T. Griffiths stated that prior to the 1914-18 European war 65 per cent. of the world's production of nickel was utilised in the manufacture of nickel steel for armament purposes, but that after the armistice production dropped to the level of the years 1890-91. New uses had since that period increased the consumption to as high a figure as any attained during the war. A considerable portion of the output was used for parts of wireless valves and also for the electrodes of sparking plugs. It was largely used by electro-deposition for building up worn parts of mechanisms, but its principal uses were for alloying with other metals.

When alloyed to iron to the extent of about 25 per cent. nickel destroyed its magnetic properties, but strangely enough a higher percentage of nickel restored those properties, and the Western Electric Co. of America had proved that after the heat treatment of high-content nickel-iron alloys, their magnetic qualities were from 10 to 13 times better than those of the best soft iron; it also had much effect in diminishing the hysteresis loss. Those properties were of much use in submarine communication cable manufacture. In heat resisting steels it prevented corrosion up to temperatures of 600 or 700 deg. C. Nickel-chromium alloys were now largely used for electrical heating purposes, and when alloyed with copper it increased the tensile strength of the latter from 21 to 45 tons per square inch; it was now greatly used for condenser tubes. Nearly all the nickel used in the world came from within the Empire, Canada producing 90 per cent. of it; there were also small deposits in New Caledonia.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraph Department. January 7th. Telephone hand sets. (B.X. 5823.)* Contact pressure testers. (B.X. 5821.)*

January 14th. Ringing motor-generator sets for automatic telephone exchanges. (B.X. 5839.)* Telephone indicators. (B.X. 5822.)*

January 28th. Induction coils and register plates. (B.X. 5899.)*

February 25th. Jumper rings and terminal strips. (B.X. 5941.)*

January 7th. Telephone cable and terminal boxes. (B.X. 5938.)

February 18th. Jacks and number plates. (B.X. 5940.)*

January 13th. State Electricity Commission of Victoria. 2,200-V switchgear and accessories. (B.X. 5827.)*

Bolivia.—A *Reuter's Trade Service* message from La Paz says that the Municipal Council of Llallagua (Department of Potosí) will shortly invite tenders for electrical plant to supply light and power to the town. The first contract will be for a maximum period of ten years. Llallagua is the centre of the Bolivian tin-mining industry, some of the largest mines in the world being situated there.

Bradford.—December 31st. Corporation. Electric passenger and goods lifts. City architect, Town Hall, Bradford.

Dartford.—December 21st. Urban District Council. Supply and delivery of 3,400 yd. of 0.1 sq. in. 3-core ,11,000-V cable. (See this issue.)

Denmark.—COPENHAGEN.—Lighting Department. One 10,000-kVA oil-cooled transformer with pumps, motors, &c. (B.X. 5945.)*

Egypt.—CAIRO.—December 28th. Ministry of Public Works. Electric generating and pumping sets for Mankabad Barracks. (B.X. 5842.)*

February 1st. Ministry of the Interior. Centrifugal well pump and direct coupled electric motor with piping and accessories. (A.X. 8811.)*

Glasgow.—December 18th. Education Authority. Installation of electric lighting in two schools. Specifications (21s.) from the Education Offices, Bath Street.

Halifax.—Town Council. December 21st. Electrician's work in connection with the erection of Girls' High School, Craven Lodge. Specifications, &c. (deposit £2 2s.) from Mr. A. C. Tipple, borough engineer.

India.—December 20th. Bombay, Baroda & Central India Railway Co. Supply of glass boxes, plates and wood separators for accumulators. (December 6th.)

Kirkcaldy.—December 18th. Education Authority. Electrical and heating work, at additions to St. Agatha's R.C. school, Methil, and Bell-Baxter school, Cupar. Schedules (deposit £1 1s. each) from Mr. E. Sandilands, architect and master of works, Education Offices, Kirkcaldy.

Liverpool.—December 23rd. Electricity Supply Department. Supply of twelve 750-kVA transformers. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—December 21st. Supply, delivery and erection of 132,000-V transformers for the Mid-East England Electricity Scheme, 1929. (November 22nd.)

January 6th. Supply, delivery, and erection of 132-kV overhead transmission lines (special crossings and high spans), for the North-West England and North Wales Electricity Scheme, 1928. (November 29th.)

January 20th. Supply, delivery and erection of 3,300-V, 6,600-V and 11,000-V switchgear for connecting the Board's supply to undertakers' busbars, North-West England and North Wales Scheme. (See this issue.)

ISLINGTON.—January 9th. St. Mary Parish Guardians. Supply and erection of five automatic electric lifts at the Infirmary, Highgate Hill, N. (December 6th.)

January 17th. Electrical and engineer's stores for one year commencing April 1st next. (See this issue.)

METROPOLITAN ASYLUMS BOARD.—January 2nd. Alterations to electric lighting installation at the South-Western Fever Hospital, London Road, Stockwell, and installation of car-washing and disinfecting apparatus at Brook, North-Western, South-Eastern and South-Western ambulance stations. (December 6th.)

January 2nd. Replating a 500-ampere-hour electrical storage battery at St. Luke's Hospital, Lowestoft. (See this issue.)

Maidstone.—December 21st. Committee of Visitors. Electrical installation for lighting, heating, &c., at the Mental Hospital, Barming Heath. (See this issue.)

Manchester.—Electricity Committee. December 17th. Supply and erection of one 6,600-V sheet-steel type transformer kiosk and switchgear. (November 29th.)

Millom.—December 20th. Urban District Council. E.h.p. and l.p. cables, pillar box, &c., and e.h.p. and l.p. switchgear, transformer, &c., for the Haverigg extension scheme. (November 22nd.)

Morocco.—December 17th. Post and Telegraph Authorities of Morocco at Rabat. Supply of 2 tons of copper wire, 2 mm. dia., and 75 tons of high-conductivity copper wire, 2 mm. dia.

New Zealand.—WELLINGTON.—Post and Telegraph Department. January 13th. Four point jacks. (B.X. 5840.)*

January 16th. Telephone switchboard plug covers. (B.X. 5879.)*

January 21st. Spare parts for automatic telephones. (B.X. 5917.)* Reed-type tension gauges. (B.X. 5918.)*

Public Works Department. January 14th. Two air compressors and two electric motors. (A.X. 8784.)*

January 28th. Three 50-kW oil-immersed circuit breakers for Arapuni. (B.X. 5878.)*

Four electric motor-driven ventilating fans. (A.X. 8857.)*

South Africa.—PRETORIA.—December 27th. Posts and Telegraph Departmnt. Telegraph material. (A.X. 8734.)*

BLOEMFONTEIN.—January 10th. Electricity Supply Department. Automatic electric traffic signals. (B.X. 5887.)*

JOHANNESBURG.—January 4th. Stores Department. Auto matic traffic signals. (B.X. 5924.)*

CAPE TOWN.—January 7th. Electricity Department. Supply of 3-core 11,000-V cable. (B.X. 5925.)*

Stoke-on-Trent.—December 31st. North-West Midlands Joint Electricity Authority. Supply and erection of e.h.p. and l.p. overhead transmission lines. (See this issue.)

Wakefield.—December 18th. West Riding Mental Hospital Board. Wiring for electric light, Wadsley Mental Hospital. near Sheffield. Mr. W. E. H. Burton, West Riding Mental Hospitals Board, Wakefield.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—SYDNEY.—New South Wales Government Railways.

Two induction voltage regulators (£2,495).—Horrocks Roxburgh Pty., Ltd.

Switchgear for Wyangala (£51,105).—Australian General Electric Co., Ltd.

Municipal Council.

Underground h. and l.p. cables (£16,950).—Enfield Cable Works, Ltd.

MELBOURNE.—State Electricity Commission of Victoria.

Steam turbo-generators, with condensing plant, for Yallourn power station extensions (£148,375).—Metropolitan-Vickers Electrical Co., Ltd. —*Tenders.*

Barrow.—Electricity Committee. Accepted:—

Renewal of lighting battery (£1,397).—Tudor Accumulator Co., Ltd.

Blean.—Board of Guardians. Accepted:—

Electric lamps for six months.—Amalgamated Lamp Co.

Bradford.—Tramways Committee.

100 steel tramcar tires (£336).—English Steel Corporation, Ltd.

100 steel tramway poles (£600).—Stewarts & Lloyds, Ltd.

Electricity Committee. Accepted:—

Boiler feed-pump suction piping for the Valley Road power station.—E. & W. H. Haley, Ltd.

Braintree.—Board of Guardians. Accepted:—

Installing electric lighting at the Institution.—East Anglian Co.

Brighton.—Watch Committee. Accepted:—

Traffic signals at Old Steine (£764).—Brighton Lighting and Electrical Engineering Co., Ltd.

Lighting Committee. Accepted:—

One 200-kVA transformer (£185).—Ferranti, Ltd.

Bristol.—Education Committee. Recommended :—
Electrical work at secondary school, Cosham (£560).—J. H. Winter & Co.

Burnley.—Electricity Committee.
Public address amplifying apparatus (£129).—Standard Telephones & Cables, Ltd.

Burton-on-Trent.—Electricity Committee. Accepted :—
Apparatus for metering sub-station (£834 plus £50 for erection).—Metropolitan-Vickers Electrical Co., Ltd.

Chesterfield.—Electricity Committee. Accepted :—
One truck-type 6,600-volt cubicle (£132).—British Thomson-Houston, Ltd.
One 150-kVA transformer (£110).—Brush Electrical Engineering Co., Ltd.

Dysart.—Town Council. Accepted :—
Electric lighting installation for the housing scheme (£115). Martins, Ltd.

Eastbourne.—Electricity Committee. Accepted :—
H.p. cable (£5,612).—Pirelli-General Cable Works, Ltd.
Two transformer kiosks (£1,049).—General Electric Co., Ltd.

Henley-on-Thames.—Town Council. Accepted :—
Installing electric lighting at the Kenton Hall, including footlights.—S. Bennett.

Hull.—Telephones Committee. Recommended :—
Insulators (£129).—Equipment and Engineering Co., Ltd.
Three tons bronze wire (£326).—T. Bolton & Sons, Ltd.
Tramways Committee. Accepted :—
440 yd. l.p. cable (£143).—Siemens Bros. & Co., Ltd.

Leeds.—Electricity Committee. Accepted.
Sub-station fuse panels (£346).—Yorkshire Switchgear and Engineering Co. Ltd.
Cables :—(£1,824), W. T. Henley's Telegraph Works Co., Ltd.; (£1,611), Enfield Cable Works, Ltd.; (£4,280), Macintosh Cable Co., Ltd.; £1,156), Hackbridge Cable Co., Ltd.; (£1,995), Derby Cables, Ltd.
Sewage pumping plant (£310).—Hathorn, Davey & Co., Ltd.

London.—LEWISHAM.—Works Committee. Recommended :—
Electrical installation at depôt garage.—A. J. Hewens and Sons.
SOUTHWARK.—Electricity Committee. Recommended :—
Feeder pillars.—W. Lucy & Co., Ltd.
Cables (£3,067).—Derby Cables, Ltd.
METROPOLITAN WATER BOARD.—Accepted :—
Switchboard at Kempton Park waterworks.—W. Lucy and Co., Ltd.

Manchester.—Transport Committee. Accepted :—
Electric overhead travelling crane.—S. H. Heywood & Co., Ltd.
Two rail planers.—Equipment & Engineering Co., Ltd.
One Crypto battery charging equipment.—Lancashire Dynamo & Motor Co., Ltd.
Electricity Committee. Accepted :—
Steam pipework.—Henry Tattersall, Ltd.
Two 10,000-kVA transformers.—Ferranti, Ltd.
33,000-V, 3-phase switchgear.—Ferguson, Pailin, Ltd.

Oldham.—Electricity Committee. Accepted :—
Overhead line equipment.—W. F. Furse & Co.

Plymouth.—Electricity Committee. Accepted :—
Sub-station gear (£561).—English Electric Co., Ltd.
Electric lamp columns (£125).—Bromford Tube Co., Ltd.
Works Committee. Accepted :—
Battery for electrically propelled vehicle (£220).—Transport Department.

Salford.—Finance Committee. Accepted :—
Equipment for private automatic branch telephone exchange (£668).—General Electric Co., Ltd.
Conservancy Committee. Recommended :—
Electrical balancing and operating gear at sewage works (£140).—Whitehead & Poole, Ltd.
Education Committee :—
Electric lighting installations :—Halton Bank School (£212).—J. Price & Sons.
London Street School (£150).—County Electrical Co. (Pendleton), Ltd.

Sheffield.—Electricity Committee. Accepted :—
Four 500-kVA transformers (£696).—Hackbridge Electric Construction Co., Ltd.

Sleaford.—Electricity Committee. Accepted :—
Switchgear.—General Electric Co., Ltd.
Public lighting cable.—Callender's Cable and Construction Co., Ltd.

West Fife.—Infectious Diseases Hospital Committee.
Electric lighting installation for the extension of the West Fife Infectious Diseases Hospital (£685).—Alex Rolland and Co.

West Ham.—Board of Guardians.—CORRECTION.—The contract for the fire alarm at Whipps Cross Hospital was awarded to F. Hodgson & Co., Ltd., and not "F. Hodgson," as stated in our last issue.

Wimbledon.—Electricity Committee. Recommended :—
Soot and grit prevention plant (£2,400).—Pneumatic Conveyance & Extraction, Ltd.

Forthcoming Events.

Association of Mining Electrical Engineers (Lothians Branch).—Saturday, December 14th. Lecture on "Transformers," by Mr. P. Butler.

Nottingham Society of Engineers.—Monday, December 16th. Technical College, Derby. 7.30 p.m. Joint meeting with the Derby Society. Lecture on "Rationalisation of Industry," by Mr. L. C. Ord.

Association of Supervising Electrical Engineers.—Tuesday, December 17th, Junior Institution of Engineers, 39, Victoria Street, S.W., 7.15 p.m. "Synchronisation of Films and Speech." Mr. S. S. A. Watkins.

Edinburgh Electrical Society.—Wednesday, December 18th, 16, Royal Terrace, Edinburgh. "Electric Traction." Mr. J. S. Ross.

Electrical Power Engineers' Association (Manchester Technical Group).—Wednesday, December 18th. Geographical Hall, Manchester. 7.15 p.m. "Developments in Power Station Condensing Plant." Mr. H. L. Guy.

Overhead Lines Association.—Wednesday, December 18th. Institution of Electrical Engineers, Savoy Place, W.C.2, 5.30 p.m. Discussion on "Some Continental and British Methods Compared," to be opened by Mr. Theodore Rich.

Institution of Electrical Engineers.—Thursday, December 19th. Institution, Savoy Place, W.C., 6 p.m. "The Heating of Buildings Electrically by means of Thermal Storage," Lieut.-Col. S. E. Monkhouse, R.E., and Mr. L. C. Grant; and "The Heat Pump—an Economical Method of Producing Low-Grade Heat from Electricity," Mr. T. G. N. Haldane.

(Scottish Centre).—Monday, December 16th. Royal Technical College, Glasgow, 7.30 p.m. "Surges and Over-Voltage Phenomena on Transmission Lines due to Lightning and Switching Disturbances." Dr. H. Norinder.

(Hampshire Sub-Centre).—Thursday, December 19th. Municipal College, Portsmouth, 7.30 p.m. "Naval Wireless Telegraphy Communications." Mr. G. Shearing and Capt. J. W. S. Dorling, R.N.

(Sheffield Sub-Centre).—Wednesday, December 18th. Royal Victoria Hotel, Sheffield, 7.30 p.m. "Public Street Lighting," &c. Mr. J. F. Colquhoun.

(Tees-side Sub-Centre).—Wednesday, December 18th. Cleveland Technical Institute, Middlesbrough, 7 p.m. Ordinary meeting.

(North-Western Students' Section).—Tuesday, December 17th, Engineers' Club, Manchester, 7.15 p.m. "Some Problems in Industrial Control Gear." Mr. J. M. Gillespie.

(South-Midland Students' Section).—Thursday, December 12th. University, Birmingham. 7.30 p.m. Film meeting.

Junior Institution of Engineers.—Friday, December 20th, 39, Victoria Street, S.W., 7.30 p.m. "Line Signalling on the Southern Railway." Mr. W. Challis.

British Electrical Development Association.—Friday, December 20th, Royal Society of Arts, John Street, Adelphi, W.C., 7.30 p.m. Display of Electrical Kinematograph Films.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following :—

GOEBEL paper slitter.
CAMERON paper slitter.
Paper cutters used with those named above in cable-making processes.
Electrically-driven cake mixers (must be small).
Vulcanised fibre boards marked "V.F.Ld."
Electrically-operated novelties for shop-window use and obtainable on hire.

Modern Welding Systems.

In lecturing on this subject recently before the Junior Institution of Engineers, Mr. W. C. Freeman reviewed the advantages of the oxyacetylene flame and the electric-arc as the sources of heat in welding operations. One advantage of electric spot welding over gas welding was its greater cheapness, it being stated that at 1d. per kWh 1,000 spots on 20-gauge steel would cost one penny.

Notes.

The Batti-Wallah's Society Luncheon.

Mr. V. Watlington, M.B.E., was the principal guest of the Batti-Wallah's Society at its luncheon held at the Hotel Cecil on December 5th. The chairman, Mr. H. L. HOWARD, presided over an attendance of about 140 members and guests. In his address, which followed the loyal toast, Mr. WATLINGTON referred to the effect on the commercial fortunes of Great Britain, of its peculiar geographical position as an island, no point of which was more than 100 miles from the sea, as compared with distances up to 2,000 miles in some other countries. This physical feature made it possible to export goods with a minimum cost for transport. In return, imports were required, and we had deliberately chosen to buy our food. The result was that our agriculture had been almost destroyed, and 80 per cent of our population were living in towns. There was now a feeling that to pay low wages on the strength of low food costs was unsatisfactory. The electrical industry was new and free from the traditions that hampered some of our older trades. Germany was now for the first time exporting a larger proportion of the total value of electrical exports than Great Britain, and there was a danger that this position might become stabilised through the reparation payments. The dominions represented by far our biggest market, but the best preference was to sell what people wanted at the right price. He expressed the view that the unemployment problem could be brought nearer to solution if we were more optimistic. Unemployment schemes should enable each man to do work of a kind with which he was familiar. Thus, for electrical development, miners could lay cables, while one ton of coal would be needed for every ton of ducts used. Only 4 per cent. of the men engaged in the electrical industry was unemployed, but there was loss through under-production.

There was much ignorance regarding the meaning of rationalisation, such as was shown in a letter in the "Correspondence" columns of the ELECTRICAL REVIEW of November 29th. Rationalisation was really the rationing of demand according to output, enabling the more efficient plant to be operated to the best advantage. It had been adopted in Germany, and had brought that country out of a state of bankruptcy. Great Britain had been slower than any other country in recovering from the effect of the war.

Thanks to the speaker were proposed by Mr. W. E. LANG, who spoke of the harmful effects abroad of depreciatory references to our efforts.

Mr. M. WHITGIFT (hon. secretary) announced that any change in ownership of the Hotel Cecil would not affect the arrangements made for the annual dinner and dance of the Society on March 21st next.

Cost of Production at Selected Stations.

The following are the principal points contained in the Electricity (Allocation of Cost of Production) Regulations, 1929, dated November 13th, 1929, made by the Electricity Commissioners under the Electricity (Supply) Act, 1926. (H.M. Stationery Office. Price 1d. net.)

The average load factor of a selected generating station shall be obtained by multiplying the number of units of electricity supplied from the station during the year of account by 100, and dividing the product by the average monthly maximum demand multiplied by the number of hours during which fuel was being consumed in the station for generating electricity or for maintaining the plant in readiness to generate.

The average monthly maximum demand shall be the arithmetical average of the monthly maximum demands on the station in those calendar months during which the station was in commission. The monthly maximum demand on the station shall be twice the largest number of units of electricity supplied from the station during any consecutive thirty minutes from the commencement or from the middle of any hour.

"Cost of fuel" shall mean the sums expended for fuel consumed plus the cost of any transport, handling, preparation, or treatment incurred in connection with the delivery of the fuel to the boiler hoppers or furnaces, and in connection with the disposal of the products or residues of combustion, together with the proper proportion of salaries and wages and any contributions for pensions, &c., less any sums received from the sale of any products or residues of combustion.

Of the following costs of production of electricity at a selected generating station shall be allocated as Fixed Costs:—(*i*) All costs incurred in rents, rates, taxes, management, establishment charges, other revenue expenditure, and interest on capital expenditure on generating plant. (*ii*) Of the works costs portions calculated from the formulæ for ascertaining the portion to be allocated as fixed costs:—

Cost of fuel; $100/100+12.8$ L. Cost of oil, water and stores; $100/100+9.66$ L. Salaries and wages; $100/100+0.38$ L. Cost of repairs, maintenance and renewals; $100/100+0.0001$ N L, where L is the average load factor of the station, and N is the number of hours during which the station was in commission in the year of account. The remainder of the costs shall be allocated as running costs.

These Regulations shall not apply to hydro-electric stations or where the circumstances are such that the Regulations could not reasonably be applied.

Power Factor and Price for Supply to Selected Stations.

The following are the principal points contained in the Electricity (Adjustment of Price according to Power Factor) Regulations, dated November 13th, 1929, made by the Electricity Commissioners under the Electricity (Supply) Act, 1926. (H.M. Stationery Office. Price 1d. net.)

The power factor at which a selected generating station is operating at the time of maximum demand on the station (or the power factor of the supply from a selected generating station to its owners at the time of the owners' maximum demand upon the station) shall be obtained by dividing twice the largest number of units of electricity supplied from the station (or to the owners) during any consecutive thirty minutes by twice the number of kilovolt ampere-hours supplied from the station during the same thirty minutes from the commencement or from the middle of any hour.

The adjustment for power factor shall be effected by multiplying such fixed kilowatt charges component by a coefficient calculated from the following formula:

$$\frac{0.8 + \frac{0.3}{B}}{0.8 + \frac{0.2}{A}},$$

where A is the power factor (expressed as a decimal) at which the selected generating station is operating at the time of maximum demand upon the station; and B is the power factor (expressed as a decimal) of the supply from the selected generating station to the owners thereof at the time of the owners' maximum demand upon the station.

These Regulations shall not apply to a hydro-electric station or where the circumstances are such that the Regulations could not reasonably be applied.

A Lighthouse Appeals for "Bart's."

A lighthouse was switched on by the Prince of Wales at St. Bartholomew's Hospital last week, to broadcast the special appeal for £1,000,000 for the reconstruction fund. The lighthouse is an actual lighthouse made by Collier & Co., who have lent it to the hospital for the purposes of the appeal. It is fixed at the top of the new surgical and operation treatre block, and is about 120 ft. above ground level. The lamp is a 5,000-W 200-V Philips' lamp of the standard type, and is fixed cap upwards. No measurement of the actual candle power of the beam has been made, but it is estimated to be approximately 750,000. The beam has been seen as far off as Bedford.

A Colliery Explosion.

Reporting on the explosion at the Milfraen Colliery, Blaenavon, Monmouthshire, where nine persons lost their lives on July 10th last, the Divisional Inspector of Mines attributes the explosion to the defective condition of the cover of an electric coal-cutting machine. He stated, according to the *Daily Telegraph*, that the examination made by the electrical staff appeared to be of a haphazard order, and the general maintenance of the plant was poor in consequence. Had the machine been carefully examined, the loss of a number of set-screws and the ill-fitting condition of the semi-circular cover of the machine would have been noted and remedied. As to the origin of the disaster, Mr. J. Macleod Carey expresses the opinion that gas was ignited by sparking at the switch within the electric coal-cutting machine; and, owing to the defective condition of the cover of that machine, flame was emitted and ignited gas outside the machine. The inspector enumerated five breaches of the Coal Mines Act of 1911, or of the general regulations, as having been committed by the management of the colliery.

Lighting Accessories.

Members and friends of the Association of Supervising Electrical Engineers attended an interesting lecture, by arrangement with the General Electric Co., Ltd., at Magnet House, London, on December 3rd when Mr. F. G. Quance dealt with "Recent Developments in Lighting Accessories with Special Reference to the Increasing Use of Insulating Material in Place of Metal." The lecture was fully illustrative of accessories usually employed in average installations, such as fuseboards, tumbler switches, wall sockets and plugs, ceiling roses, lampholders, &c., bearing on present-day practice. Mr. H. W. Roberts presided, and refreshment provided by the company was served during an interval in the proceedings.

The Incorporated Municipal Electrical Association.

The November Report (Vol. 10, No. E7) to members of the I.M.E.A. contains several items of interest to electricity supply engineers, including an account of a discussion with the Electricity Commissioners regarding change-overs from d.c. to a.c. distribution, with particular reference to the laying of new 4-core cables, and some points in favour of 3-wire single phase cables are mentioned. An account of a conference with the Central Electricity Board, on the question of liability for the cost of substituting switchgear of higher rupturing capacity than is possessed by the existing installations due to connection to the Grid, is also of topical interest. Under the heading of "Electricity for Domestic Purposes," reference is made, *inter alia*, to the need for statistics which would enable the progress made to be realised more closely.

Electrical Developments at Inverness.

On December 11th the Bught hydro-electric station of the Royal Burgh of Inverness electricity undertaking (engineer, Mr. Cecil Allan Grut) was officially inaugurated. The hydro-electric plant consists of a vertical turbine, manufactured by Messrs. Boving & Co., Ltd., directly coupled to a vertical generator by Metropolitan-Vickers Electrical Co., Ltd. The turbine is of the single-runner propeller type, operating on a varying head from 9 ft. 6 in. to 6 ft. 6 in., and runs at 250 r.p.m. The quantity of water passing through the turbine is regulated by means of a very sensitive oil-pressure governor, of Messrs. Boving & Co.'s manufacture, which is operated by means of oil at a pressure of 150 lb. per sq. in.

Direct current is generated at 480/560 volts, and, as the supply is given on the three-wire system, a middle wire static balancer has been installed, capable of dealing with 15 per cent. of the full load of the machine. The switchboard, also supplied by Metropolitan-Vickers, is entirely automatic in its operation. Once the water has been turned on and full speed attained, the automatic switchgear comes into operation, regulates the voltage, closes the main switch, puts the machine on load, and regulates the output according to the demand on the system. In actual practice it has been found extremely satisfactory, and during the trials it has run for many days on end without human supervision in any way. Protective devices are fitted, so that should a bearing become overheated, or the governor belt break, the plant is immediately shut down automatically before any damage is likely to be done. The total cost of the scheme is approximately £15,000, and, although the original estimate of output was 450,000 units per annum, it is anticipated that the output will be something like 600,000 units per annum.

This plant, which is capable of supplying the night demand between the hours of midnight and 7 a.m. during the winter, and 6 p.m. and 7.30 a.m. during the summer, will enable the steam generating station at Waterloo Place to be shut down during these hours, thus affecting considerable economies in coal, wages, &c. The current leaves the power-house by means of two overhead lines, one of which crosses the river near the Ness Islands and connects into the cable network in Island Bank Road. The bulk of the current, however, passes by means of an overhead line and underground cable to a distribution pillar, which has been erected near the Infirmary Bridge, and from this point the current is fed into the cable network on both sides of the river, as well as into Culduthel Road.

On the same day a refuse power installation, to work in conjunction with the electricity works, was also opened. This consists of two 2-cell trough grate units, each unit of two cells being complete with its own forced draught fan, electrically-driven charging gear, and combustion chamber. Between these two units is placed a Babcock & Wilcox water-tube boiler with an evaporating capacity of 12,000 lb. of steam per hour. The Underfeed Stoker Co., Ltd., was entrusted with the order for the mechanical stoker, which is of their newest "L" type. Forced draught is provided by means of an electrically-driven fan, and overhead coal bunkers are fitted, the coal from the bunkers passing through a chute to an automatic weighing-machine into the stoker hopper. The steam from the boiler is conveyed across the road to the electricity works by means of a 6-in. steam main, suitably lagged and suspended from gantries supported by suitable lattice steel towers. The condensate from the generating plant at the electricity works is conveyed back underneath the intervening road into the hot-well tank in the destructor works.

Mining Electrical Engineers' Dinner.

The annual dinner of the West of Scotland Branch of the Association of Mining Electrical Engineers was held in Glasgow on December 7th; Mr. G. N. Holmes, the local chairman, presided. Prof. Howe, of Glasgow University replying to the toast of "The Guests," referred to the opposition of the coal industry to the Grampian water-power electricity scheme, and said there was a curious fallacy about that water-power cost nothing. For that matter neither did coal, so long as one left it alone. In use one was likely to cost as much as the other.

Electricity Charges in Wandsworth.

As a sequel to the inquiry held in July into the charges made for electricity in Wandsworth by the London Electric Supply Co., Ltd., the Minister of Transport has made an Order reducing the maximum price which the company may charge for electricity to 5d. per kWh as from the December quarterly readings, and reducing the minimum quarterly charges to 6s. 3d. in each of the winter quarters, and to 4s. 2d. in each of the summer quarters. The County of London Electric Supply Company has announced that as from the December quarterly meter readings the lighting flat rate of 5½d. per kWh will be reduced to 5d. per kWh in those areas of the company within the Administrative County of London. In addition to the districts mentioned above, this announcement includes Dulwich, Roehampton, Southwark, Camberwell, Bermondsey, Clerkenwell, Finsbury, and Holborn.

Lots Road Mishap.

A defect at the Lots Road generating station disorganised a large part of the London Underground electric railways on Wednesday morning last. The trouble is said to have been due to a cable defect, which occurred at 7.12 a.m., and all trains stopped for some time.

Appointments Vacant.

Mains superintendent for Barnes Urban District Council. Meter repairer and tester for Peterborough Corporation. Telegraph foremen for the Government of the Gold Coast. Engineering assistant for sub-stations for Hull Corporation. Junior charge engineer for Barrow-in-Furness Corporation. Cable-jointer and electrician for Holywood Urban District Council. (See our advertisement pages to-day.)

Electricity Supply Rifle League.

Members of the above-named League foregathered on November 30th at the Talbot Restaurant, London Wall, for their annual dinner and presentation of prizes.

Mr. R. S. Downe (Brompton and Kensington) presided over the gathering, which numbered 79 diners, and after dinner a successful concert was provided by various members and friends of the clubs concerned, under the able direction of Mr. A. Allsup.

Smethwick Fire Disaster.

The attention of the Council of the Institution of Electrical Engineers has been drawn to newspaper reports of the proceedings at the inquest, which concluded on the 25th September last, upon eleven persons who lost their lives by reason of a fire at premises in Rolfe Street, Smethwick, on September 2nd.

Some of the evidence purported to show that the fire was due to a defective electrical installation in a neighbouring building, and in this connection one of the witnesses condemned the use of lead-covered rubber-insulated cables for the wiring of public buildings. This statement has caused great uneasiness in the minds of consulting engineers, architects, electrical contractors, and others, inasmuch as the use of lead-covered rubber-insulated cables is permitted by, and the proper methods of installation of such cables are set out in, the "Regulations for the Electrical Equipment of Buildings" issued by the Institution. These Regulations are recognised by consulting engineers, electrical contractors, electricity supply authorities, and the Fire Offices, as representing the best standard practice, and the Fire Offices in particular recommend their use.

The Council re-affirms, therefore, that it is of the opinion that lead-sheath cables are both suitable and safe for electrical installations, if installed and maintained in accordance with the I.E.E. Wiring Regulations.

Rural Electrification.

Mr. J. H. Thomas and Mr. George Lansbury recently received a deputation from the Rural Reconstruction Association on the subject of "Agriculture and Unemployment," at the House of Commons. Mr. R. Borlase Matthews advocated the need for rural electrification on the basis that (*a*) it would mean immediate work for many of the workless; (*b*) it would cause many of the town toilers to go back to the land, as the actual work of equipment would give employment in both town and country; and (*c*) it would convert farming from a peasant pastime into an important business. The area supplied by the electricity mains of each town should be extended until it met the areas supplied by the mains of adjoining towns. A practical remedy would be: (1) a survey of the electrical distribution system of the country, with a view to the allotment of rural areas to those adjoining electricity suppliers who were technically and commercially best able to serve them; (2) after allotment, to see that the responsibility was undertaken adequately to supply each rural area with electricity. For the benefit of the management of most urban electricity supply undertakings, existing experience of rural electrification (of which a considerable amount was available) should be collated and analysed and then put into such shape as would facilitate the acquisition of the necessary knowledge of the subject. The Government should consider the following recommendations and, when possible, introduce some form of legislation to deal with them:—

(1) Some form of long-term loans at low rates of interest in the initial years should be arranged for the construction of rural lines, for until load was developed as a result of educational work it was extremely difficult to make the lines remunerative.

(2) Those authorities which obtained such loans should be compelled to undertake educational publicity campaigns in the use of electricity in rural areas, and commence repaying their loans as soon as revenue permitted.

(3) Those undertakings now holding Orders to supply in rural areas should be compelled to prepare schemes which would fit in with the national programme of development of rural areas.

(4) Vested interests, from wayleaves upwards, should not be allowed to hold up such schemes of public service.

(5) Overhead lines should be erected with no more restrictions than were considered necessary in the case of any other public utility service.

(6 An inquiry should be held into the procedure of the Electricity Commissioners.

(7) At least one member of the Electricity Commissioners should be an expert in rural electrification, and should be given sufficient authority to take such action and employ such civilian staff as might be deemed necessary to produce effective results as quickly as possible.

London Subway Conference.

A conference of all the authorities interested in the provision of subways for mains under streets is suggested by the General Purposes Committee of the L.C.C. to consider the Holborn explosions, which occurred some months ago. It is suggested that the people to be invited to the proposed conference should include representatives of the L.C.C., the Postmaster-General, Minister of Transport, Commissioner of Metropolitan Police, Commissioner of City of London Police, Corporation of the City of London, the Metropolitan Boroughs Standing Joint Committee, the Metropolitan Water Board, and representatives of various electricity, gas, and railway companies. The committee further suggests, according to the *Evening News*, that the question of holding a Government inquiry into the London subway question should be considered, if necessary, after the conference.

International Illumination Congress.

Illumination Engineering Societies exist in Great Britain, United States, Germany, Austria, Holland, and Japan; and everywhere organisations are developing which aim at bringing about better lighting. The movement towards international treatment of the subject had its origin in the International Photometric Commission, founded in 1901, and in 1913 effect was given to that desire by the reconstitution of the Commission on a wider basis as the International Commission on Illumination, to which are linked National Committees in all the chief countries of the world. Meetings in Paris (1921), Geneva (1924), Bellagio (1927), and New York (1928), revealed continuous progress. The International Illumination Congress and the session of the Commission held in the United States last year probably formed the most important conference on lighting matters ever held, and was attended by 500 delegates from Austria, Belgium, France, Germany, Gt. Britain, Holland, Italy, Japan, Sweden, Switzerland, and the United States.

The next International Illumination Congress is to be held in Great Britain in 1931. In this country the machinery for the study of illumination is perhaps more perfectly organised than in many other places, and the aid of all the leading scientific and technical bodies interested in, and of organisations concerned with, gas and electric lighting is being secured. The National Illumination Committee of Great Britain, in co-operation with the Illuminating Engineering Society, will be responsible for this important event, and several committees are already at work on the arrangements. The Congress will take place from September 3rd to 13th, 1931, and will be combined with a *voyage d'etude* to places of interest in England and Scotland, so that other cities beside London will share in the work of the Congress. Papers dealing with the most varied aspects of lighting will be presented and so grouped as to ensure that topics of special local interest will be dealt with at each centre. The Congress will be followed by the technical meetings of the International Commission on Illumination, which will be held at Cambridge from September 13 to 19th. The hon. general secretary of the Congress is Colonel C. H. Silvester Evans, Illuminating Engineering Society, 32, Victoria Street, London, S.W.1.

Northampton Polytechnic Conversazione.

The annual prize distribution and conversazione were held at the Polytechnic, Clerkenwell, on December 6th and 7th. On Friday a report on the work of the session was presented by Mr. S. C. Laws, M.A., M.Sc. (principal), and this was followed by an address by Mr. H. A. Game, M.A., chairman of the governing body, and the presentation of prizes and certificates by Mrs. Game. The presentation was preceded and followed by organ recitals by the Polytechnic organist, Mr. S. Dicker, and, as in preceding years, the laboratories, workshops, &c., were opened for inspection by visitors. On Saturday, the programme was continued, when an excellent promenade concert was given by the Polytechnic Choral and Operatic Society and the Polytechnic Orchestra. Gymnastic, badminton, boxing, and swimming displays were also given, and the function was brought to a successful conclusion with dancing.

Extensions at Ashford.

The electricity undertaking of the Ashford (Kent) Urban District Council has made very good progress since its inception three years ago, and reference to this enterprise was made recently, when there was officially started up a new 1,350-h.p. Diesel solid-injection oil engine which, with super-charger, is capable of an output of 900 kW. The engine, which has been supplied (with an alternator by the English Electric Co., Ltd.) by Messrs. Davey, Paxman & Co., Ltd., is the first of its type, it is claimed, to be installed in an electricity station in this country. Last year Ashford had the honour of having the first 600-kW engine of its type in the country, also supplied by Messrs. Davey, Paxman. The Council started its undertaking three years ago with three 400-kW sets, and now has plant with a total capacity of 2,700 kW. It has applied to the Electricity Commissioners for another engine to be installed next summer. The available space in the works will then have become occupied, and the probability is that further supplies in excess of what the undertaking produces will be taken from the Central Electricity Board. In the year ending March, 1928, the undertaking generated 1,854,000 units, which was increased in the following year to 2,915,000 units, whilst it is anticipated that in the current year the undertaking will generate 4,225,000 units. About fifty miles of cable have been laid and further extensions are in hand. A supply is given to the Southern Railway works at Ashford and to neighbouring villages. Customers are being added at the rate of 70 per month.

When the new plant was started up by the wife of the electrical engineer, Mr. H. Wilson, A.M.I.E.E., tributes were paid to the department, and especially to the engineer. Mr. Edward Paxman said that last year the firm supplied the Council with what was the largest engine of its type in the country. Now, practically within twelve months, they were starting up an engine fully 33 per cent. bigger in capacity, but taking no more space and having greater efficiency. Once again this would be the largest of its type in the country. Ashford's progress was probably unparalleled. Speeches were made by various representatives, including the vice-chairman of the Council, who stated that the average cost of 1.72d. to consumers was below that of a number of larger towns in Kent. The new plant, with the alternator, cost £7,798.

Great Indian Peninsula Railway.

At the inauguration of the G.I.P. main-line electrification (Bombay to Poona section) by his Excellency the Governor of Bombay (Sir Frederick Sykes), the special train, made up of the new articulated Poona mail train, the coaches of which were finished in aluminium picked out with red (only possible with electric traction), was on its outward journey hauled by two of the largest G.I.P. steam express locomotives, suitably decorated for the occasion, the leading engine being "Hero," the war memorial engine hitherto always used on such occasions, but now thus employed probably for the last time.

Dining coaches made up a 350-ton train, and four hours were taken to complete the journey, which was not too comfortable, as, according to the *Times of India*, a wind conspired with the locomotive to deposit the largest possible amount of ash and dirt on the seats and floors of the coaches and their passengers.

After the ceremony in Poona, the Governor's coach was also attached to the train, bringing up the weight to 450 tons, which the electric locomotive hauled home at the maximum permissible speed in one hour less than the outward journey, and with, of course, complete freedom from smoke and dirt.

Sir Frederick Sykes pointed out that Bombay, as the gateway of India, had to distribute an immense transit traffic, and the electrification would accelerate the process.

Mr. D. S. Burn, Agent of the G.I.P. Railway, said that the newly electrified main line would give the G.I.P. Railway the greatest length of electrified main line in the British Empire, and would constitute one of the most important main-line electrifications in the world. He enumerated the many advantages of electrification, among which were: freedom from smoke in towns and tunnels; improved train service, both as regarded speed and frequency; increased carrying capacity of line, without costly additions to the permanent way, due to the possibility of hauling heavier trains at higher speeds; reduced cost of haulage as compared with steam traction; reduction in wear and tear of rolling stock, owing to the employment of regenerative braking; reduced liability of locomotive failure or loss of time on locomotive account; economy in coal consumption and the utilisation of lower-grade coal in the power house; and freedom from the anxiety about failure of water supply.

Mr. Burn went on to describe how in order to ascertain the best type of passenger locomotive for use under Indian conditions, three different types were ordered, the result being that an order for the 22-passenger locomotives, each weighing 102 tons, was placed with the Metropolitan-Vickers Electrical Co., Ltd., which also supplied the 41 to 120-ton freight locomotives for the same line.

The Electrical Association for Women.

On November 27th, Mr. E. E. Sharp gave a very interesting lecture to members at their London Club Room, 46, Kensington Court, on some of his electrical experiences in Australia and New Zealand.

The Association has just concluded a most successful series of three evening lectures at the Club Room by Mr. H. Bourne, of the Hendon Electric Supply Co., Ltd., on "How electric heaters, cookers, and cleaners are wired, and why they get out of order; the construction, use, and maintenance of electric kettles, toasters, irons, and other small apparatus; and practical hints about bells, batteries, and wireless sets." On each occasion the lecturer brought with him samples of the apparatus under discussion, which were taken to pieces, every point being discussed and criticised by the lecturer and the audience. Mr. Bourne stressed the importance of having all-electric appliances in the bathroom fixed and earthed, and further urged that radiator connections should be strongly constructed and the earth wire visible throughout its length.

A successful dance and whist drive was held recently at Bristol by the Bristol and District Branch of the E.A.W., at which there was an attendance of 120 members and friends.

On November 26th members of the Birmingham and Midlands Branch of the Association spent an interesting afternoon at the showrooms of Frigidaire, Ltd., Birmingham, and on December 4th a successful bridge and whist drive was held at the Grand Hotel by the same branch.

Institution Notes.

Institution of Electrical Engineers.

IRISH CENTRE.—For the purpose of creating interest and attempting to form a students' section, members in Northern Ireland met last week in Belfast in the physics lecture theatre of Queen's University. The lecturer was Mr. T. J. Monaghan, M.I.E.E., chairman of the Irish Centre, and Mr. F. H. Whysall, M.I.E.E., city electrical engineer, Belfast, presided. It was the first meeting of northern members to be held in Belfast since the war. Mr. Monaghan dealt with the risk taken in electrical working and, comparing it with the risks of all other forms of industry and sport, showed by figures from England, U.S.A., Holland, &c., that the death-roll per year from electrical causes was much lower. Mr. Whysall said the headquarters of the Irish Centre were in Dublin, and as a consequence the meetings of the committee of the local section and its ordinary meetings were held there. Several attempts had been made to bring the members in Northern Ireland into closer touch with the Centre, but it was very difficult for Ulster members to make the journey to Dublin and attend the meetings regularly. One serious consequence was that young engineers who were eligible as student members, and who were situated in Northern Ireland, did not join the Institution, but he was strongly of opinion that it would be in their best interests to do so, even under existing circumstances.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

We are anxious to correct any wrong impression that may have been conveyed by our use of the term "full-time" secretaryship in our leaderette of last week (p. 982) on the annual festival of the Electrical Trades Benevolent Institution. Mr. F. B. O. HAWES never was a "full-time secretary" for the Institution. In May last year we referred to his splendid work in performing "the full secretarial duties" and that is what we really intended to convey last week. Nobody remembers or appreciates better than ourselves the very fine services that Mr. Hawes rendered to the E.T.B.I. over a period when the industry made various other important demands upon his time. For many years prior to 1928 he held the honorary secretaryship, and he did so until he retired from business and from that position early this year, as, being resident away from London, he felt he could no longer be of service even in an advisory capacity to the Fund.

We are able this week to reproduce a photograph of Mr. F. FORREST, who, as we have already reported, is to succeed Mr. R. A. Chattock as City Electrical Engineer of Birmingham. After serving a five years' apprenticeship with Messrs.

Beaufort] *[Birmingham.*

Mr. F. Forrest, M.I.E.E.

The prospective City Electrical Engineer of Birmingham.

Siemens Bros. & Co., Ltd., and passing through their various departments, Mr. Forrest was on the engineering staff of the yacht *Alberta*, belonging to King Leopold II of Belgium. He held that position for eighteen months, and then was chief assistant engineer to the Tynemouth Corporation for nine months. Subsequently he became assistant station engineer to the Charing Cross Company, and remained with that concern for 4½ years. His connection with the Birmingham undertaking commenced in 1906, when he was placed in charge of the Sub-Stations Department. During a period of eleven years Mr. Forrest was also responsible for the whole of the electrical plant and switchgear installed in the generating stations. He has been chief assistant to Mr. Chattock for the past 12 years; during that period the output and maximum load has more than doubled. Last year he visited many of the large undertakings in the United States and Canada on behalf of the Birmingham Corporation; in the previous year he had made a similar inspection of power stations in Germany. Mr. Forrest is a past-chairman of the Midland Centre of the I.E.E.; he is a member of the Institution of Mechanical Engineers, and also of the American Institute of Electrical Engineers.

Reuter states that Sir WILLIAM HALDANE has paid a visit to Czecho-Slovakia to study the electrification of agriculture in that country.

Sir GILBERT C. VYLE has been re-elected president of the British Engineers' Association for the year 1929-1930.

The Oldham Corporation Tramway Committee has appointed Mr. J. F. RICHARDS as general manager of the Corporation Tramway Department at a commencing salary of £650 per annum, rising to £750 per annum, and Mr. A. HENTHORN, chief clerk, as deputy general manager at a salary of £412 per annum.

The Bradford Tramways Committee recommends that Mr. N. A. SCURRAH, technical assistant, be appointed works superintendent in the Tramways Department, at a commencing salary of £400 per annum.

The *Evening Standard* of December 9th reported that in the early hours of the previous Saturday Mr. W. BEAVIS, works manager of the Newhaven and Seaford Electricity Co., was called out to attend to a slight mishap at the power station. He has not been seen since, but the wreckage of a car believed to be Mr. Beavis's has been recovered from the sea. It is surmised that the force of the gale wrenched the steering wheel from Mr. Beavis's hands and that the car was blown over the sea wall.

Mr. CHARLES E. D. GREENHALGH, deputy electrical engineer at Watford, is recommended by the Ilkley Electricity Committee for appointment as electrical engineer to the Urban District Council.

The Bedford Town Council has appointed Mr. H. W. MILLATT, showroom manager in the Chester Electricity Department, as sales engineer for the rural electrification scheme, at a salary of £400 per annum.

Following the resignation of Mr. H. W. LAING, tramway manager at Lytham-St. Annes after 23 years' service, several departmental heads are passing into retirement shortly. These include Mr. J. PARTINGTON, rolling stock superintendent (27 years' service), Mr. P. PARTINGTON, tramway electrical engineer (25 years' service), Mr. J. WALSH, storekeeper (26 years' service), and Mr. T. BARON, permanent-way engineer (17 years' service).

The *Electrical World* states that Mr. SAMUEL INSULL, president of the Chicago Edison Co. and other electrical enterprises, celebrated his 70th birthday on November 11th.

A financial daily states that Mr. MAX BYNG has joined the board of "Phantestra" (Renn's Gramophone and Wireless), Ltd.

The London County Council Highways Committee recommends that Mr. J. H. PARKER, West Hartlepool borough electrical engineer and general manager of transport service, be appointed electrical engineer in the Council's tramway

department at a salary of £1,700 a year. A photograph of Mr. Parker, together with an account of his career, appeared in the ELECTRICAL REVIEW for August 7th, 1925 (p. 225), when he vacated the post of deputy electrical engineer at Croydon to go to West Hartlepool.

Mr. JAMES O'BEIRN, M.B., D.Ph., of Galway, has been appointed a director of the Marconi International Marine Communication Co., Ltd.

Obituary.—SIR ASHTON LISTER.—We regret to learn of the death, on December 6th, of Sir Ashton Lister, founder of Messrs. R. A. Lister & Co., Ltd., of Dursley. He was 84 years of age, and received his knighthood in 1911.

MR. J. C. NICHOLSON.—We regret to report the death, at the age of 69 years, of Mr. John Charles Nicholson, head of the firm of Messrs. Jenson & Nicholson, vanish manufacturers, of Stratford, London. He passed away last Saturday.

MR. T. DODD.—It is reported in the Press that Mr. Thomas Dodd, a pioneer X-ray worker at Newcastle, has died from the effects of permatitis contracted thirteen years ago.

Wills.—Mr. HERBERT SEFTON-JONES, chartered patent agent, left £17,068 gross and £12,895 net personalty.

Mr. J. C. D. JONES, formerly electrician-in-chief to the Eastern Telegraph Co., Ltd., at Singapore, who died recently at the age of 77 years, left £47,307 net and £47,587 gross personalty.

Financial Section.

[New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Bel-Canto Radio Reproducer Co. (N.S.), Ltd.—Private company. Registered December 3rd. Capital £1,100 in 100 ordinary, and 1,000 7½ per cent. cumulative preference shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in all kinds of apparatus for wireless transmission and reception, &c. The permanent directors are:—S. W. Mosby, address not stated; R. C. Byng, Kingsmead, Winkfield, Windsor; J. B. Blakeborough, Woodleigh, Brighouse; A. E. C. Harvey, address not stated. Solicitors: Simpson, Curtis, Dixon & Burrill, Leeds.

Mortimer, Gall & Co., Ltd.—Private company. Registered December 3rd. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and general engineers and contractors, manufacturers of and dealers in electrical radio or other goods, &c. The directors are:—J. M. Hawkins, "Waverley," Thorpewood Avenue, Sydenham Hill, S.E.26, electrical engineer; E. C. G. Hawkins, 2, Overhill Road, S.E.22, secretary. Secretary: E. C. G. Hawkins. Registered office: 26, Cheapside, E.C.2.

Telephone Manufacturing Co. (1929), Ltd.—Registered as a public company December 3rd. Capital, £250,000 in 5s. shares. Objects: To acquire the business carried on by the Telephone Manufacturing Co., Ltd. (other than shares in the subsidiary companies referred to in an agreement between the said company and F. C. T. Lane, the liquidator thereof of the first part, Telephone Rentals, Ltd., of the second part, and this company of the third part, and the consideration for such shares to be received by such company), and to carry on the business of makers, sellers, hirers-out, buyers, installers, maintainers, and workers of private or other telephones and telegraphs, makers and sellers of electrical apparatus of all kinds, &c. The subscribers (each with one share) are:—C. P. Heseltine, Pinewood, Chislehurst, stockbroker; H. W. Morrison, Lavant House, Roehampton; J. MacMahon, Sheriff Park House, Rutherglen, director of Telephone Manufacturing Co., Ltd.; C. Cochran, 34, Dalziel Drive, Glasgow, director of Telephone Manufacturing Co., Ltd.; W. Campbell, Picket Wood, Merstham, director of Telephone Manufacturing Co., Ltd.; C. Reid, 1, Leadenhall Street, E.C.3; F. T. Jackson, 20, Herne Hill, S.E.24, director of Telephone Manufacturing Co., Ltd. The first directors are to be appointed by the subscribers. Registered office: Hollingsworth Works, Martell Road, West Dulwich, S.E.21.

Telephone Rentals, Ltd.—Registered as a public company December 3rd. Capital, £600,000 in 5s. shares. Objects: To acquire from the Telephone Manufacturing Co., Ltd., that part of its undertaking which consists of the issued share capital of those of its subsidiary companies mentioned in an agreement between the above-mentioned company and F. C. T. Lane, the liquidator thereof of the first part, the company of the second part, and the Telephone Manufacturing Co. (1929), Ltd., of the third part, to acquire and hold shares, stocks, debentures, &c., to carry on the business of making, selling, hiring-out, buying, installing, maintaining, and working private or other telephones and telegraphs, makers and sellers of electrical apparatus, &c. The subscribers are similar to those in the case of the Telephone Manufacturing Co. (1929), Ltd. Registered office: Hollingsworth Works, Martell Road, West Dulwich, S.E.21.

J. N. Boyes, Ltd.—Private company. Registered December 4th. Capital, £500 in £1 shares. Objects: To acquire the business of electrical engineering and motor repairing carried on by J. N. Boyes, at 10, William Street, London, and to carry on the business of mechanical, electrical, wireless and general engineers, manufacturers and repairers of and dealers in motor cars, &c. The directors are: D. Harris and C. B. Benson, addresses not stated. Registered office: 10, Serjeants' Inn, Temple, E.C.4.

Frederick Squire, Ltd.—Private company. Registered December 2nd. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio apparatus, loud-speakers, apparatus for the transmission and reception of pictures by wireless, scientific and optical instruments, gramophones and records, amplifiers, generators, accumulators and batteries, mechanical and electrical engineers, manufacturers of and dealers in motor cars, cycles, &c. The first directors are: F. Squire, engineer, and Emily Squire, 64, Linthorpe Road, Stamford Hill, N.16 (both permanent). Registered office: King's Works, Leswin Place, Stoke Newington, N.16.

Dunoon & District Electricity Supply Co., Ltd.—Registered as a public company December 2nd. Capital, £20,000 in £1 shares. Objects: To take over and put into operation the Dunoon Electricity Special Order, 1929, and to carry on the business of an electric light and power supply company in all its branches. The subscribers (each with one share) are: G. H. Webber, 179, Abbey Wood Road, S.E.2, clerk; S. A. Pierpoint, 7, Muschamp Road, S.E.15, clerk; and five others. The first directors are to be appointed by the subscribers. The board shall not, without the sanction of a general meeting, so borrow or raise any money, other than temporary loans from bankers or others, in the ordinary course of the company's business, as to make the amount borrowed and then outstanding exceed £75,000. Solicitors: J. D. Langton & Passmore, 71, Powis Street, Woolwich, S.E.18.

Electric Service Co. (Birmingham), Ltd.—Private company. Registered December 2nd. Capital, £2,500 in £1 shares. Objects: To carry on the business of electric service and accumulator specialists formerly carried on by P. H. Jones and Nancy Jones, at 125, Bristol Street, Birmingham. The first directors are: P. H. Jones, 14, Vicarage Road, Edgbaston, Birmingham, engineer; W. E. Tollworthy, 26, Rotton Park Road, Edgbaston, manager; Nancy Jones and W. Tollworthy, addresses not stated. Qualification: £250. Secretary: Nancy Jones. Registered office: 125, Bristol Street, Birmingham.

Electrical Reproducers, Ltd.—Private company. Registered in Edinburgh on November 27th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, radio, mechanical, motor, marine, consulting and mining engineers, &c. The directors are: W. L. Greenwood, Bankhead Cottage, Carmunnock, Glasgow; S. J. Smith, 39, Randolph Road, Broomhill, Glasgow, electrical engineers. Registered office: 102, West Regent Street, Glasgow, C.2.

English Alabaster Marble & Lighting Co., Ltd.—Private company. Registered December 2nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in alabaster bowls, vases, table stands, and brackets, &c., electrical and wireless engineers and experts, designers and manufacturers of and dealers in lamps, globes, brackets, &c. The directors are: H. H. D. Duncan (chairman), 144, Boleyn Road, Forest Gate, E.7; G. H. Covington, Langham House, Queensberry Road, Kettering. Qualification: £100 shares.

Vulcanized Fibre Marketing Board, Ltd.—Private company. Registered December 5th. Capital, £1,000 in £1 shares. Objects: To promote the marketing of vulcanised fibre and

insulating materials, &c. The permanent directors are: F. N. MacEchern (chairman), "Merven," Christchurch Avenue, Finchley, N.12, vulcanised fibre manufacturer; A. M. Livingstone, 2, St. Albans Road, N.W.5, paper manufacturer. Secretary: J. F. Hudson, Dacre House, 5, Arundel Street, W.C.2.

Air-Way, Ltd.—Private company. Registered December 6th. Capital, £20,000 in 13,000 "A" and 7,000 "B" shares of £1 each. Objects:—To carry on the business of manufacturers of, and dealers in electrical and sanitary apparatus, appliances, parts and accessories of all kinds, &c. The directors are:—A. J. M. Duncan, 95, Barkston Gardens, S.W.3; J. H. Bulloch, 98, Clifton Court, St. John's Wood, N.W.8; J. I. Pickering, 11a, Hogarth Road, Earl's Court, S.W.3; M. C. Dizer, "Westfield," West Heath Road, Hampstead, N.W.; H. A. Pridham, 61, Curzon Street, W.1 (sales manager, Kolster-Brandes, Ltd.). Registered office: 15-19, Cavendish Place, W.

Official Returns of Electrical Companies.

Lancashire Ignition Co., Ltd.—Capital, £1,500 in £1 shares. Return dated July 26th, 1929. Two shares taken up. £2 paid. Mortgages and charges, nil.

Richardsons, Westgarth & Co., Ltd.—Capital, £700,000 in 350,000 preference and 350,000 ordinary shares of £1 each. Return dated May 24th (filed June 12th), 1929. All shares taken up. £700,000 paid. Mortgages and charges: £25,605.

Vaughan Crane Co., Ltd.—Capital, £150,000 in 50,000 preference and 100,000 ordinary shares of £1 each. Return dated September 25th, 1929. 16,880 preference and 53,578 ordinary shares taken up. £43,669 paid. £26,789 considered as paid. Mortgages and charges, nil.

W. J. Henderson & Co., Ltd.—Mortgage debenture dated November 12th, 1929, to secure £2,000, charged on the company's property, present and future, including uncalled capital. Holder:—A. F. Phelp, 54, Queen's Road, Brighton.

Runbaken Motor and Electrical Accessories, Ltd.—Particulars filed of £5,000 debentures authorised November 14th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

G. & L. Electrical Supply Co., Ltd.—Particulars filed of £2,000 debentures authorised October 29th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Electrical Agencies (London), Ltd.—Particulars filed of £800 debentures authorised October 29th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Falconar, Cross & Co., Ltd.—Capital, £7,000 in 3,500 preference and 3,500 ordinary shares of £1 each. Return dated July 26th, 1929. 3,300 preference and 2,002 ordinary shares taken up. £2 paid. £5,500 considered as paid. Mortgages and charges, nil.

Metropolitan-Vickers Electrical Co., Ltd.—Capital, £250,000 in £1 shares. Return dated August 1st, 1929. 10,002 shares taken up. £10,002 paid. Mortgages and charges, nil.

Metropolitan-Vickers Electrical Co. (Mediterranean), Ltd.—Capital, £1,000 in £1 shares. Return dated August 26th, 1929. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Upfields Wireless, Ltd.—Mortgage dated November 18th, 1929, to secure £1,000, charged on 5, Hughenden Place, Hastings. Holders: Hastings Permanent Building Society, 17, Havelock Road, Hastings.

Fellows Manufacturing Co., Ltd.—Particulars filed of £36,000 second debentures and premium of 7½ per cent. authorised July 11th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £15,200 (on November 15th, 1929).

P. A. Bristow, 68½, Upper Thames Street E.C.4, was appointed receiver and manager on November 29th, 1929, under powers contained in debentures dated September 27th, 1927.

Calcutta Tramways Co., Ltd.—Capital, £1,400,000 in 700,000 preference and 700,000 ordinary shares of £1 each. Return dated June 27th, 1929. 250,000 preference and 700,000 ordinary shares taken up. £764,900 paid (being £1 per share on 250,000 preference and 409,100 ordinary, 8s. per share on 22,000 ordinary, 10s. per share on 40,000 ordinary, and 14s. per share on 110,000 ordinary shares). £185,100 considered as paid (being £1 per share on 118,900 ordinary, 12s. per share on 22,000 ordinary, 10s. per share on 40,000 ordinary, and 6s. per share on 110,000 ordinary shares). Mortgages and charges: £350,000 4½ per cent. first debenture stock, and £233,600 7 per cent. second (registered) debentures.

Henley's (South Africa) Telegraph Works Co., Ltd.—Capital, £2,000 in £1 shares. Return dated July 19th, 1929. All shares taken up. £2,000 paid. Mortgages and charges, nil.

British Battery Co., Ltd.—Debenture dated November 28th, 1929, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder:—E. H. E. Morley, The Homestead, Sydney Road, Watford.

Herne Bay & District Electricity Supply Co., Ltd.—Particulars filed of £30,000 debentures authorised November 26th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £20,000.

Smethurst & Co. (London), Ltd.—Deed of covenant dated November 27th, 1929, to secure £500, charged on 72, Duke Street, Grosvenor Square, W. Holder: Miss S. P. Findlater, c/o Barclays Bank, Ltd., 208, Regent Street, W.1.

Charing Cross Electricity Supply Co., Ltd.—Satisfaction in full (1) on April 1st, 1926, of £250,000 secured notes, secured by trust deed dated April 12th, and registered April 28th, 1920, and (2) on January 15th, 1909, of debentures authorised May 31st, 1901, and registered on various dates between August 8th, 1901, and February 8th, 1906, securing £472,000. (Notices filed November 27th, 1929.)

Keighley Electrical Engineering Co., Ltd.—Satisfaction to the extent of £500 on November 20th, 1929, of second debenture dated March 16th, and registered March 21st, 1928.

Charles Warren, Ltd.—Capital, £6,000 in £1 shares. Return dated May 30th (filed July 19th), 1929. 5,700 shares taken up. £1,500 paid. £4,200 considered as paid. Mortgages and charges, nil.

Whitehall Electric Investments, Ltd.—Capital, £7,500,000 in 2,500,000 preference and 5,000,000 ordinary shares of £1 each. Return dated July 4th, 1929. All shares taken up. £2,500,007 paid on 2,500,000 preference and 7 ordinary shares. £4,999,993 considered as paid on 4,999,993 ordinary shares. Mortgages and charges: £3,191,548.

Premier Accumulator Co. (1921), Ltd.—Capital, £40,000 in £1 shares. Return dated June 26th, 1929. All shares taken up. £18,749 paid (being £1 per share on 11,249 and 15s. per share on 10,000 shares). £18,751 considered as paid on 18,751 shares. Mortgages and charges, nil.

Sphere Investment Trust, Ltd. (formerly United Electric Tramways of Montevideo, Ltd.).—Capital, £1,000,000 in 500,000 preference and 500,000 ordinary shares of £1 each. Return dated June 25th, 1929. All shares taken up. £295,105 paid on 131,105 preference and 164,000 ordinary shares £704,895 considered as paid on 368,895 preference and 336,000 ordinary shares. Mortgages and charges, nil.

Langham Radio, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 14th, 1929, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

City Notes.

Venezuela Telephone and Electrical Appliances Co., Ltd.

The directors' report for the year ended June 30th last records a profit of £53,995, as compared with £48,843 in 1927-28. After meeting debenture interest, &c., there is a balance of £38,387, to which is added £47,832 brought forward, making £86,219. The ordinary dividend is maintained at 8 per cent.; £8,766 is written off issue expenses; £1,500 is transferred to the 6 per cent. first mortgage debenture sinking fund; and £30,000 is placed to renewals and depreciation reserve, leaving £31,128 to be carried forward. There was a satisfactory rise in telephone service receipts—from £115,988 to £131,356. Automatic equipment for a further 2,000 lines (making 8,000 lines) is being installed in Caracas. In June last the capital was increased to £600,000 by the creation of 320,000 "A" ordinary shares of £1 each, of which 136,975 were offered to and taken up by shareholders on a *pro rata* basis at par. At the annual meeting on December 17th resolutions will be put forward increasing the directors' borrowing powers from £100,000 to £200,000 and increasing their remuneration owing to an addition to their number.

Stock Exchange Notices.

Application has been made to the Committee to allow the following to be quoted officially:—

Aldershot Gas, Water, and District Lighting Company.—£110,000 4 per cent. consolidated preference stock.

Bristol Tramways and Carriage Company.—1,000,000 ordinary shares of £1 each, fully paid, Nos. 1 to 1,000,000; and 500,000 preference shares of £1 each, fully paid, Nos. 1 to 500,000.

Dealings in the following have been allowed by the Committee under Rule 159:—

Avery (W. and T.), Ltd.—676,458 ordinary shares of £1 each fully paid, Nos. 1 to 676,458. 26,846 5 per cent. cumulative

"A" preference shares of £5 each fully paid, Nos. 1 to 26,846. 147,128 5½ per cent. cumulative "B" preference shares of £1 each fully paid, Nos. 1 to 147,128.

Underground Electric Railways Co. of London, Ltd.—951 ordinary shares of £1 each fully paid, Nos. 7,277,322 to 7,278,272.

S. Smith & Sons (Motor Accessories), Ltd.

Presiding at the annual meeting last week, Mr. W. Henderson-Cleland (chairman) said that the main products of the company and its subsidiaries were now fitted as standard to over 95 per cent. of the British-made motor cars and commercial vehicles, while their magnetos, sparking plugs, &c., were fitted to a lesser degree. Its subsidiary, the M-L Magneto Syndicate, Ltd., had had a satisfactory year, and success for its products had been obtained in the Tourist Trophy races. The report and accounts were adopted.

American General Electric.

It was announced this week that this company proposes to divide its common shares into four shares of no par value and to place the new shares on a $1.60 annual dividend basis; the current corresponding dividend is $1.50.

The usual quarterly dividend of $1.50 has been declared on the common shares, together with one of $0.15 on the special stock.

Ebonite Container Co., Ltd.

At an extraordinary meeting on December 4th a resolution was passed raising the capital to £100,000 by the creation of 200,000 ordinary shares of 4s. each. The new capital will be employed in the acquisition of a controlling interest in another company.

Callender's Share and Investment Trust, Ltd.

The revenue to August 31st was £45,598, and the net profit £37,219, of which £500 is placed to reserve, and £3,000 to special reserve. A dividend of 20 per cent., less tax (as against 15 per cent.) is proposed, and £36,364 is carried forward.

County of London Electric Supply Co., Ltd.

The directors have decided to make an issue of £1 ordinary shares. These will be offered to the present ordinary shareholders in the proportion of one new share for each three held.

Beauharnois Power Corporation.

This company has made an issue of $30,000,000 of 30-year 6 per cent. bonds for the purpose of raising capital for the construction of a 500,000-h.p. hydro-electric scheme on the St. Lawrence River.

Yarrow & Co., Ltd.

The profit for the year ended June 30th last, after deducting debenture interest and depreciation, is £3,320, to which is added £4,154, making £7,474, which the directors recommend should be carried forward.

English Electric Co., Ltd.

We are officially informed that the statements regarding the reconstruction of the company's capital which have appeared in the daily Press are unauthorised and untrue.

Postal Telegraph and Cable Corporation.

The directors have declared a quarterly dividend of 1¾ per cent. on the 7 per cent. non-cumulative preferred stock, payable January 2nd to stockholders of record December 13th.

Petters, Ltd.

An interim dividend on the 7½ per cent. cumulative preference shares has been declared in respect of the half-year ended September 30th, less tax at 4s.

Great Northern Telegraph Co., Ltd.

An interim dividend of 5 per cent. per annum, less tax, for the half year, payable on January 1st, has been declared.

Barcelona Traction, Light and Power Co., Ltd.

The directors have declared a quarterly dividend of 1¾ per cent. in respect of the fixed dividend of 7 per cent. per annum on the non-cumulative participating preference shares.

Murex, Ltd.

This company announces the acquisition of about 92 per cent. of the issued capital of the Premier Electric Welding Co., Ltd., from Imperial Chemical Industries, Ltd.

Shawinigan Water and Power Co.

A dividend of $0.625 per share has been declared on the common shares for the quarter ending December 31st.

Pennsylvania Water and Power Co.

The quarterly dividend on the common shares has been raised from $½ to $¾ for the quarter ending December 31st.

Stocks and Shares.

TUESDAY EVENING.

THE Stock Exchange has entered upon the last account of the year, and, from Monday next week, dealings will start for payment on January 9th, 1930. It is possible that business in stocks and shares is restrained for the moment by the dislike that most people have to parting from money on the eve of the New Year, for window-dressing continues to exercise a hold upon the mind of the ordinary person, and he likes to make as fair a show as he can in his pass book at the end of December. There are, however, favourable factors which have come into play just recently, one of them being a substantial recovery in American stocks and shares, including those of the utility companies, while at home there is a weekly prospect of the Bank Rate being reduced to 5 per cent. Against these influences has to be set the continued anxiety respecting the outcome of the settlement in Hatry stock and shares, no date for the settlement having yet been fixed by the Stock Exchange Committee. Business is quiet, but there is a general disposition to regard the outlook for 1930 as being one in which the development of electricity for power, domestic, and other purposes is likely to stand out as being amongst the principal features.

London's Tubes and Trams.

The Government has been bombarded with questions as to what it really means in announcing its intentions with regard to London traffic. To what extent the stockholders themselves will be affected is a matter still in doubt. Various vague statements have been made, which profess to illuminate the Government's policy, but none of these touch the principal question as to what is going to be done in the way of dealing with the issues of the various companies concerned in the arrangement. So long as this twilight of uncertainty remains, the various stocks and shares can hardly fail to be dull in price, but the fall of 4 points in Underground income bonds served to bring in a few purchasers, and the price rallied a trifle after its drop. Metropolitan consolidated put on a point, by reason of dividend hopes. The other stocks in the group have scarcely changed, while the position of the market in the various tramway shares is much the same as that of a week ago; namely, that although prices are quoted, these are mainly nominal, and either buyer or seller may find it difficult to deal, except by way of negotiation. London and Suburban Traction preference are marked up 6d. to 10s.

There is on offer a few thousand pounds of London Electric Railway ordinary stock, at 70¾. Last year's dividend was 5 per cent. On this basis, the yield on the money comes to £7 2s. 6d. per cent.

Home Electricity Shares.

In the list of prices of shares in Home Electricity companies given here, only one change has occurred on the week. This is so unusual as to be noteworthy, and it indicates the condition of business quietude that prevails in a good many of the investment markets round the Stock Exchange. County of London Electric Supply ordinary shares are 1s. down at 47s. The company announces a reduction of charges in its areas within the administrative County of London, and the South Metropolitan Electric Light & Power Company is also lowering its charges. The Grampian Electricity Company's scheme for generation by water power, as a feeder to the national grid, was thrown out by the House of Lords Select Committee. Of the shares which are not quoted in our own lists, Northamptons are unchanged at 44s. 6d., having remained without alteration for a fortnight. Egham & Staines ordinary have fallen 1s. to 34s., and the new are called easier at 33s. British Light & Power are steady at 13s. 9d., Atlas at 27s. 6d. Isle of Thanet, at 32s., are 1s. better, the preference being 23s. Of the new issues, Metropolitans are firm at 5s. 6d. premium, and Midland Counties new improved to 1s. 3d. premium. Scottish Electric new shares eased off to 27s. 6d., which is 1s. 6d. less than the price of the senior issue. Lancashire Electric 7 per cent. preference show a slight decline at 27s. Whitehall Electric 6 per cent. debenture is up 1¼ points, at 102.

Telegraphs and Telephones.

Further falls have occurred in the prices of Cables & Wireless stocks. The "A" ordinary shed 3, going back to 76¼, and the "B" ordinary stock, at 37½, is similarly lower. Both have been still easier during the week. In explanation of the flatness of the "B" stock, a report gained ground to the effect that the first year's working of the Merger is likely to show that the prospect of a dividend on the junior issue is nebulous for the next few years. It has already been mentioned here that the dividend on the "A" stock for the first twelve months' working is thought by some people to be unlikely to exceed 4 per cent., against the 7½ per cent. to which the stock is entitled, and that it will be a couple of years before the latter rate is likely to be paid. Following this line of argument, it is contended that the "B" stock cannot expect to come in for any distribution, at all events until three years have passed, and that, for the next twelve months or so, the stock can hardly be regarded as anything better than

either a gambling counter, or a lock-up, representative of the equity of a business which, if it flourishes in accordance with anticipation, should one of these days be of substantial value. There is a good deal of difference between the present price of 37½ and the 72 at which the stock was first negotiated early in July this year—to say nothing of the 104 to which it rose within the course of a very few days. Regarded as a rich man's gamble, the stock is probably worth putting away at anything like the current quotation.

Marconis and Telephones.

Marconi Marine Wireless shares are ½ up at 2 7/16, the shares having now recovered from the dulness which overtook them upon the reduction in the last-announced interim dividend. According to report, the company is doing exceedingly well, though the optimists do not go so far as to commit themselves to the prophecy that the dividend for the full year will be equal to the 15 per cent. paid in respect of the previous period. Anglo-American Telegraph preferred stock has strengthened to 100½. Venezuela Telephone ordinary advanced to 25s. 6d., the preference also being better at 26s. 3d., on the issue of an annual report which, once more, shows very consistent progress. At the forthcoming meeting next Tuesday, the directors will take power to increase the capital and their own remuneration. The "A" shares, which were issued last June at par, stand at 20s. They carry no voting rights, and rank for dividend as from July 1st this year. There seems to be undue discrepancy between the prices of these "A" shares and those of the company's ordinary and preference. The last two are to receive 8 per cent. for the year. Anglo-Portuguese Telephones receded to 20s. 6d.

Dollar Stocks.

Brazilian Tractions, at 46, show a gain of 4 points, and stand out as one of the very few shares in which there is lively interest taken by the public in Stock Exchange markets. The buying started from New York and Montreal, where previously heavy liquidation had reduced the price of the shares below 40. There is talk of the company increasing its dividend, as we mentioned here last week, and this has imparted a better tendency, not only to the common shares, but also to the preference, which have gained 10 points at 150. Montreal Light & Power shares, at 136½, are 16 points up, Shawinigan, at 82½, 4 points. Pennsylvania Power hardened to 78½; the company has raised its dividend, from ½ per quarter, to ⅝ per quarter. American Telephone & Telegraph, at 235, shows a gain of 7. International Telephone & Telegraphs, at 85, are 12 points higher. Hydro-Electrics, which were 34 a week or two ago, are nearly 42. The Mexican group, however, remains heavy. There is a fall of a couple of points in Mexican Light and Power first bonds to 73½. Sao Paulo Electric firsts, at 83½, are lower. Electrical Development of Ontario firsts strengthened to 97½. It is a little ironical to read that progress in Vancouver has been threatened by a spell of unprecedented dry weather. This is said to have created a serious situation for the city's industries, by reason of the fear of a shortage of power, and the Municipality met to consider the advisability of rationing the supply. The Montreal Light & Power Company, and the Ontario Hydro-Electric Power Commission, are concerned in the plan of the new hydro-electric power programme, put forward by the Beauharnois Power Corporation. The potential development is two million horse power, and the project is described as being one of the largest power enterprises in the world. A bond issue is being made for the purpose of financing construction, and work on a plant of 500,000 h.p. on the St. Lawrence River has already been started.

The Manufacturing Group.

Various reports have been current during the past week to the effect that the English Electric Company proposes to reorganise its capital, but these have been contradicted, although it may not be very difficult to guess the reason for the rumours having come into circulation. The ordinary shares are unchanged at 6s. 3d.; the preference, at 7s. 6d., are 1s. 3d. down. Crompton Parkinson ordinary can be bought at 20s., or a little less. Edison Swan ordinary last changed bands at 13s. 6d., this being about a month ago. Associated Electrical Industries ordinary, at 25s. 9d., have lost 3s. G.E.C. ordinary continue to advance, and at 2⅝ are 1/16 better. The 7½ per cent. "B" preference drooped to 25s. Callenders retain their rise at 3¾, and the group as a whole shows firmness. There has been little evidence of liquidation in this section. People who study the trend of share values will have observed that the market for electrical manufacturing companies' shares has been one of the very few which, through the recent crisis, kept up its end with almost unimpaired strength. Anticipations have been raised in connection with a possible issue of bonus shares next year by one of the big manufacturing concerns, but nothing definite has yet transpired. Ever-Ready shares touched 20s. before reacting to 19s. Telephone Manufacturing shares are unchanged at 4s. 3d. The company has now been split into the Telephone Manufacturing Co. (1929), Ltd., and Telephone Rentals, Ltd.

The market for iron and steel shares has been a little better, with Vickers hardening to 8s. Babcock & Wilcox remain at 62s. Rubber shares are finishing the year in a condition of somnolence, not to say stupor.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Approx. Dividend. 1927.	1928.	Price Dec. 10 1929.	Rise or fall	Yield p.c.
Bournemouth and Poole	1	15	15	58/9	—	5 2 0
Brompton Ordinary	1	8½	8½	25/6	-6d.	5 9 10
Charing Cross Ordinary	1	8½	8½	26/6	—	5 5 8
do. do. 4½% Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8⅞	8⅞	25/-	—	5 12 0
City of London	1	10	10	39/-	—	4 7 6
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	1½	—	... ..
County of London	1	7	10	47/-	—1/-	4 5 1
do. do. 6% Pref.... ...	1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref.	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	1	11	11	48/3	—	4 11 8
Kensington Ordinary	1	8	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 2
London Electric	1	8½	9	27/-	—	5 1 10
Metropolitan	1	9	9	37/6	—	4 16 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	6½	28/-	—	4 12 10
Mid. Elec. Power	1	15	8	33/9	—	4 14 10
Newcastle-on-Tyne Ordinary ...	1	6	6	23/9	—	5 1 1
do. 7% Pref.	1	7	7	25/-	—	5 13 0
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref. ...	1	6	6	23/-	—	5 9 1
St. James' and Pall Mall	1	8	8	26/-	—	5 7 8
Scottish Power	1	8	8	29/-	—	5 12 3
South London	1	9½	8½	25/6	—	5 9 10
Urban Ordinary	1	7	7	35/-	—	4 0 0
Westminster Ordinary	1	8½	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	33/9	—	4 14 10

Home Rails.

Central London Ord. Assented ...	Stock	4	4	71	—	5 12 8
Metropolitan	„	8	8½	69½	+1	5 12 0
do. District	„	4	5	72	—	6 19 0
Underground Electric	£1	5	7	21/6	—	6 10 3
do. do. Income ...	Bonds	6	6	103	—	5 16 6

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	100½	+1	5 19 6
do. Def.	„	1½	1½	24½	—	6 4 8
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5% Pref. ...	Stock	—	—	96	—	5 14
do. A 7½ Ord.	„	—	—	76½	-3	... ...
do. B Ord.	„	—	—	37½	-3	... ...
Globe Tel. and T. Ord.	10	10	10	23	—	*4 7 0
do. do. Pref.	10	6	6	10⅝	—	5 9 1
Great Northern Tel.	10	20	17½	29	—	6 0 9
Indo-European	25	10	10	53½	—	*3 16 9
Marconi-Marine	1	12½	15	2 7/16	+½	... ...
Oriental Telephone Ord	1	12	12	21½	—	... ...

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8½	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	3½	+1/16	9 12 0
do. do. 5% Deb. ...	Stock	5	5	72½	—	6 18 0
British Electric Traction Def. Ord.	„	5	5	153/5	+100	... .
do. do. Pref. Ord.	„	8	8	120	—	6 13 4
Brazil Traction	100	7	8	46	+4	4 7 0
Brit. Columbia Elec. Rly. Pref. ...	Stock	5	5	87½	—	5 14 3
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/-	+6d.	... ...
London United Tram Deb. ...	Stock	4	4	51½	—	7 15 4
Mexico Trams, 5% Bonds	—	5	5	72½	—	6 18 0
Mexican Light Common	100	Nil	Nil	75	—	... .
do. 7% Pref.	100	7	7	77½	—	9 0 6
do. 1st Bonds	—	5	5	73½	-2	6 16 1
Yorkshire (West Riding)		Nil	Nil	5/-	—	... ..

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	—	25/9	-8/-	4 13 2
Babcock & Wilcox	1	12	15	62/-	—	*4 16 9
British Aluminium Ord.	1	10	10	46/-	—	*4 7 0
British Elec. Transformer Pref. ...	1	7	7	13/-	—	... ..
British Insulated Ord.	1	15	15	3⅜	—	4 0 0
Brush Ord.	Stock	10	10	126½	—	7 18 1
Callenders	1	15	15	3⅜	—	4 0 0
do. 6½% Pref.	1	6½	6½	1½	—	5 4 0
Crompton Parkinson Ord.	£/-	—	20	20/-	—	7 10 0
do. 8% Pref.	1	8	8	25/-	—	6 8 0
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	7 1 3
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	5½	15/-	—	7 6 8
Enfield Cable Ord.	1	20	20	4⅜	—	4 2 0
English Electric	1	Nil	Nil	6/3	—	... ..
do. do. Pref.	1	8	Nil	7/6	-1/16	... ..
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	10	10	2⅜	+1/16	4 4 3
Henley...	1	25	20	5⅜	—	5 2 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	11/3	—	... ..
Johnson & Phillips	1	10	—	26/3	—	5 10 3
Siemens Ord.	1	7½	7½	26/3	—	5 14 3
Telegraph Construction	12	10	10	28	—	5 4 2
Victoria Falls Ord.	1	15	15	2⅜	—	5 4 2

* Dividends paid free of Income Tax.

Electrical Imports of Spain.

Statistics for 1927 and 1928 Compared.

THE following figures, showing the imports of electrical goods into Spain in 1928 are taken from the recently issued trade statistics. The totals for 1927 are given for purposes of comparison, and notes of increases or decreases added. All the important classes of goods, with the exception of wires and cables, show increases, some of them, *e.g.*, dynamos, transformers, &c., and electrical fittings, of quite a substantial character. In the former group the advance in the share of the United States has been marked, as also has that of Switzerland. Generally Great Britain does not make a very good showing; in fact her trade is scarcely maintained at the level of 1927.

Of interest in connection with the future market fer power plant in Spain is the formation at the instance of the Ministry of Public Works of a Council of Power, which is to include representatives of the Government, railways, power and fuel companies, electrochemical industries and consumers generally. Its object is to draft plans for the production of power for public service and industries at the cheapest possible rates. The Council has to form a syndicate and arrange for a "grid" system for the use of the railways and chemical industries. The initial price of electricity is to be 0.6 peseta and the ultimate price, if possible, 0.1 peseta

	1927. Quantities. 100 kg.	1928. Quantities. 100 kg.	Inc. or dec.
Dynamos, motors, transformers, switchgear, &c.—			
Total	48,550	69,670	+21,120
From Germany	11,110	13,510	+ 2,400
,, United States	3,310	11,950	+ 8,640
,, France	13,023	9,630	- 3,393
,, Great Britain	5,040	5,440	+ 400
,, Sweden	3,180	3,480	+ 300
,, Belgium	830	870	+ 40
,, Switzerland	9,220	21,650	+12,430
,, Italy	730	570	- 160
,, Holland	1,524	1,000	- 524
Self-contained generating sets—			
Total	5,676	6,900	+ 1,224
From Germany	780	700	- 80
,, France	2,440	3,910	+ 1,470
,, Great Britain	1,350	350	- 1,000
,, United States	270	440	+ 170
,, Switzerland	650	1,132	+ 482
Switchboards—			
Total	839	1,670	+ 831
From Germany	181	280	+ 99
,, United States	22	245	+ 223
,, France	225	610	+ 385
,, Great Britain	108	150	+ 42
Electrical fittings (switches, lampholders, &c.)—			
Total	7,710	19,010	+11,300
From United States	980	2,730	+ 1,750
,, Germany	1,850	2,890	+ 1,040
,, Great Britain	480	2,170	+ 1,690
,, Belgium	600	3,500	+ 2,900
Electrical measuring instruments and parts thereof—			
Total	1,760	1,810	+ 50
From Germany	900	830	- 70
,, France	190	186	- 4
,, Switzerland	497	696	+ 199
,, Great Britain	22	26	+ 4
Stoves, heaters, cookers, irons, &c.—			
Total	680	1,160	+ 480
From Germany	160	410	+ 250
,, Switzerland	350	550	+ 200
Accumulators, dry batteries, and parts—			
Total	6,870	7,930	+ 1,060
From Denmark	1,040	1,330	+ 290
,, Germany	1,360	1,860	+ 500
,, Great Britain	640	640	—
,, United States	2,197	1,510	- 687
,, France	1,160	2,460	+ 1,300
,, Sweden	130	130	—
Wires and cables—			
Total	32,360	14,980	-17,380
From Great Britain	17,820	3,420	-14,400
,, Germany	3,390	3,670	+ 280
,, France	8,840	3,110	- 5,730
,, United States	250	905	+ 655
Incandescent electric lamps—			
Total	1,270	1,620	+ 350
From Holland	710	483	- 227
,, Great Britain	10	7	- 3
,, France	150	246	+ 96
Telegraph and telephone switchboards and apparatus—			
Total	5,820	3,120	- 2,700
From France	317	320	+ 3
,, Belgium	4,568	1,324	- 3,244
,, Germany	284	210	- 74
,, Great Britain	162	450	+ 288
,, United States	360	600	+ 240
,, Sweden	340	230	- 110
Wireless valves—			
Total	17	15	- 2
From Germany	5	5	- 5
,, United States	7	5	- 2
,, France	4	1	- 3
,, Holland	—	8	+ 8
Electric mercury vapour lamps, searchlights, &c.—			
Total	80	166	+ 86
From United States	5	—	- 5
,, France	4	3	- 1
,, Germany	57	156	+ 99
Carbons, other electrodes, &c.—			
Total	5,530	6,400	+ 870
From United States	3,190	2,915	- 175
,, Great Britain	754	510	- 244
,, Germany	230	1,063	+ 833
,, France	1,150	1,380	+ 230
Insulating tapes, fabrics, and tubes—			
Total	12,970	3,850	- 9,120
From United States	11,670	3,150	- 8,520
,, Germany	1,055	490	- 565
,, Great Britain	40	10	- 30

Domestic Appliances in Holland.

Opportunities for British Makers.

THE Canadian Trade Commissioner at Rotterdam calls attention to the efforts which are being made in Holland to popularise the use of household electrical appliances. Judging by what he says on this subject, the British exporter of such goods should not find great difficulty in increasing his sales. One obstacle to the widespread use of domestic apparatus is the absence of standardised voltage, a handicap with which he is familiar in his own home market. It is clear that a vigorous advertising campaign is necessary, and it would appear from the results of the Canadian Trade Commissioner's investigations that the campaign should be largely directed towards convincing the prospective consumer that household electrical appliances are not expensive from the point of view of the amount of energy necessary for their operation. Connected with this side of the question is the fact that domestic help is plentiful and cheap in the rural districts, although becoming dearer in the towns and cities. The Trade Commissioner proceeds to examine in detail the state of the market for various domestic electrical devices. A summary of his remarks follows:—

Vacuum cleaners are the most extensively used of any of the appliances on sale. They are welcomed in the homes of the middle and upper classes, but the field of sale seems to be fairly well covered, as there are about 25 different makes on the market. The prices vary from £17 10s. to £7, some German makes being among the cheaper models. They can be bought on the hire-purchase system. Of electric heaters Dutch manufacturers control the larger part of the sale. They are all of the reflector type, and throw heat only in one direction. The sale of electric washing machines has made some progress during the last three years, but they are still looked upon as novelties, if not as curiosities. There are no laundry rooms in the basements of houses where washing can be done, and in the newer type of dwellings the kitchens are too small to be used for the purpose. Most Dutch housewives, therefore, send their washing out to laundries. A European model of the "dolly" pattern, with a motor placed beneath a wooden tub, is sold as cheaply as £10. An American refrigerator has been widely advertised in Holland in the past year or two, but it is reported that the results have been somewhat disappointing. In addition, there are two European makes on the market selling at from £40 to £95. Prospects do not seem very promising for this article, as ice is cheap and plentiful in Holland, and perishable food easy to obtain. Electric irons are commonly used in Holland, most of them coming from Germany, but stoves and ranges are practically unknown. For cooking the use of electricity is hampered by the cheapness of gas and gas stoves.

New Electrical Schemes before Parliament.

A Brief Summary of Notices which have appeared in the *London Gazette*.

WE publish below a list of proposals of an electrical nature that will come forward in the 1929-30 session of Parliament. Readers who are desirous of obtaining further information will find the notices published in the *London Gazette* for November 22nd and 26th.

(a) Electric Light and Power.

Shropshire, Worcestershire and Staffordshire Electric Power Co.—Additional financial powers, extension of area of supply to include the borough of Stratford-upon-Avon and the urban districts of Bromyard and Ledbury; transfer to the company of the undertaking authorised by the Halesowen Electric Lighting Order, 1909.

Brixham Gas and Electricity Co.—Extension of area of supply to include a portion of the urban district of Paignton; revocation of the powers of supply of electricity within the added area of the Paignton Electric Light and Power Co., Ltd.

East Devon Electricity Co., Ltd.—Transfer to the company of the Sidmouth Urban District Council electricity undertaking.

Darlington Corporation.—Further provisions as to electricity supply.

Ascot District Gas and Electricity Co.—Further powers in connection with the electricity undertaking.

Bristol Corporation.—Extension of the boundaries of the City and the inclusion of the added areas in the area of supply of electricity, &c.

Brighton Corporation.—Extension of area of electricity supply to include parts of borough of Hove, urban districts of Portslade-by-Sea and Shoreham-by-Sea and parishes of Old Shoreham and Lancing; further provision as regards electricity supply; further provisions in regard to the tramway and trolley vehicle undertakings; financial provisions, &c.

Cardiff Corporation.—Further provisions with reference to the electricity undertaking and the tramway undertaking; financial provisions, &c.

Manchester Corporation.—Further provisions as to the electricity undertaking and the tramway undertaking.

Rotherham Corporation.—Extension of area of supply of electricity; further provisions with regard to the electricity undertaking and the tramway undertaking.

Southport Corporation.—Further provisions with regard to the Corporation's electricity undertaking.

Lancaster Corporation.—Further provisions with regard to the electricity undertaking, &c.

Stoke-on-Trent.—Extension of the Corporation's limits of supply of electricity; further electricity provisions.

(b) Electric Tramways, Motor-'buses and Trolley Vehicles.

London United Tramways, Ltd.—Provision and running of trolley vehicles along all or any of the streets and roads comprised in the tramway and light railway routes of the company.

Hastings and Tramways Co., Ltd.—Powers to run on additional trolley routes in the county borough of Hastings and the borough of Bexhill.

Wednesbury Corporation.—Special powers with reference to the surrender of the lease of the tramways and granting of new lease of or the sale or assignment of the tramways, &c.

West Bromwich Corporation.—Extension of the boundary of the borough; purchase of a portion of the tramways of the South Staffordshire Tramways Co., &c., in the borough of Wednesbury and the Urban District of Darlaston, &c.; extension of Corporation's limit of supply of electricity to the added part of Walsall and the added part of Great Barr.

Portsmouth Corporation.—Power to substitute the trolley vehicle system for all the Corporation tramways in the city; further powers in connection with the electricity undertaking.

Barnsley and District.—Powers by the Yorkshire Tractien Co., Ltd., to abandon certain light railways constructed under the Barnsley and District Light Railway Order, 1900.

Llanelly and District Electric Supply Co., Ltd.—Powers to run trolley vehicles in the borough and rural district of Llanelly.

Birkenhead Corporation.—Powers to substitute the trolley vehicle system for all the tramways of the Corporation in the Borough and the Urban District of Bebington and Bromborough.

Newport Corporation.—Provision and running of trolley vehicles in the borough and the parish of Christchurch, &c.

Middlesex County Council.—Extension of lease of light railways and tramways; further provisions with reference to the supply of electricity and further powers for local authorities in the county for the time being authorised to supply electricity.

Rochdale Corporation.—Powers to abandon tramways on certain routes and substitute omnibuses; further powers in connection with the electricity undertaking, &c.

Liverpool Corporation.—Substitution of trolley vehicle systems for all tramways and light railways of the Corporation in the City, County Boroughs of Bootle, the Urban Districts of Litherland, Huyton with Roby and Prescot and the parishes of Netherton and Aintree; further powers in connection with the electricity undertaking, &c.

Dearne District.—Applicatiton by the Urban District Councils of Wombwell, Wath-upon-Dearne, Bolton-upon-Dearne and Thurnscoe and the Yorkshire Traction Co., Ltd., for Trolley Vehicle Provisional Orders; further provisions with respect to light railway and trolley vehicle undertakings of the Councils.

Leeds Corporation.—Construction of new tramways, &c.

Leicester Corporation.—Provision and running of trolley vehicles along existing tramway routes, &c.

Stockton-on-Tees.—Abandonment and discontinuance of certain tramways and the running of omnibuses by the Corporation along the routes of the existing tramways, &c.

Walsall Corporation.—Purchase by the Corporation of certain tramways of the South Staffordshire Tramways Co. in the Borough of Wednesbury and the Urban District of Darlaston; also the tramways, apparatus and works of the Borough Council of Wednesbury between certain boundaries, the abandonment and discontinuance when acquired and the provision and running of omnibuses, &c.

Kingston-upon-Hull Corporation.—Discontinuance of tramways when trolley vehicles or omnibuses are provided; further provisions for the tramway and trolley vehicle undertakings.

Bournemouth Corporation.—Provision and running of trolley vehicles along any tramway route within or without the borough.

Nottingham Corporation.—Construction and working of trolley vehicles along certain tramway routes.

Derby Corporation.—Provision of trolley vehicles along any streets in the borough along which the Corporation is authorised to work tramways, and also along further routes in the borough; financial provisions, &c.

Southend-on-Sea Corporation.—Further provisions relating to the light railway, trolley vehicle, &c., undertakings; financial provisions.

London County Council.—(Charing Cross Scheme).—Construction and working of tramways in the Borough of Lambeth; construction by the Southern Railway a railway in the Metropolitan Boroughs of Southwark and Lambeth; a new terminal station in the Borough of Lambeth; construction by the London Electric Railway of a new subway and booking hall and to close the existing Strand station; power to the Metropolitan District Railway Co. to demolish and reconstruct the Charing Cross station and to construct a new station.

(c) Railways.

London Electric Railway, Metropolitan District Railway, Central London Railway, and City and South London Railway Companies.—Powers for the construction of new railways, widenings, subways and works in the counties of London, Middlesex and Hertford; extension of the London

Electric Railway northwards from Finsbury Park to Cockfosters, a mile north of East Barnet, a distance of seven miles; widening of the Metropolitan District Company's Hounslow extension railway for a distance of two miles to connect up with widenings authorised by the Act of 1926; also widening and alteration of the District Company's railway at Hammersmith; deviation of the existing Piccadilly Tube railway in the neighbourhood of Down Street and Hyde Park Corner; powers to construct booking halls and subways at Knightsbridge, Hyde Park Corner, King's Cross, Warren Street, Edgware Road, Russell Square and Marble Arch, &c.

Southern Railway.—Construction of a new railway between seven and eight miles in length, from Motspur Park station on the Raynes Park and Epsom line, to a point on the existing line between Ashstead and Leatherhead; widening of the Hounslow Loop Line; improvements at the City station of the Waterloo and City Railway.

Metropolitan Railway.—Two new railways at Wembley, one between Wembley and Great and Little Stanmore, four miles in length, and the other an extension in the Urban District of Wembley; additional capital powers.

Radio Manufacturers' Association.

Annual Dinner and Meeting.

THE third annual dinner of the Radio Manufacturers' Association was held on December 4th at the Savoy Hotel, London. Sir William Bull (president) presiding.

The chief guest of the evening was Mr. F. KELLAWAY who, in proposing the toast of the Association, said that no one would venture to make a prophecy with regard to the future of wireless, and he was of opinion that we were only at the beginning of what wireless was destined to do for mankind. The wireless industry had made a greater change in the social life of the world than any other invention since printing. There would be greater developments made during the next quarter of a century than they had seen in the past. He wished, however, to draw attention to the advantage which had been taken, in certain instances, by the charlatan and the sharepusher. Scandalous abuse had taken place in the last few years in connection with public flotations. Men holding prominent positions should be a little more careful in lending their names to the exploitation of inventions which had never been properly examined. The licences which the Marconi Company had issued to the trade had prevented the importation into this country of any substantial number of receiving sets. The latest figures available showed that the United States was annually exporting complete apparatus to the value of £1,700,000, but only £7,000 worth of the total reached this country. This apparatus was kept out by the Marconi licence and by the arrangement that the Marconi Company had made with the Radio Corporation of America and the Telefunken group in Germany.

In responding to the toast, Mr. J. T. MOULD (chairman of the Association), said that the Association had succeeded in bringing about a spirit of co-operation in the industry. Its monthly luncheons had had the effect of convincing them all that, although they were competitors, they might also be friends, and as to many matters their interests were identical, and could be more quickly advanced by united action. It commenced four years ago with a membership of 44, but it now included all the leading radio manufacturers, and the number of members had increased to 152. In pursuance of its exploitation policy the Association was now going to finance the whole of the industry by spending a large sum of money on propaganda during Radio Week in January next.

The toast of "Our Guests" was proposed by Capt. J. W. BARBER, and responded to by Lt.-Col. J. T. C. MOORE-BRABAZON. Mr. R. M. ELLIS proposed "The Press," and Mr. A. BEVERLEY BAXTER responded.

The dinner was followed by a dance and cabaret show.

Annual Meeting and Luncheon.

The annual meeting was held on the following day (December 5th), at the Hotel Cecil, when Sir William Bull again occupied the chair. After the conclusion of the formal business, including the adoption of the report and accounts and the re-election of the president and vice-presidents, there was a ballot of members of the Executive Council, the result of which was announced during a subsequent luncheon. The report refers to the negotiations with the Marconi Company regarding royalties, which resulted in the production of a standard form of agreement which the Association undertook to recommend to its members. Regulations governing the participation of members in exhibitions, other than those organised by the Association, have been drawn up. These restrict members in certain directions but do not prohibit the display of their apparatus by distributors. Mention is made of the success of the last Radio Exhibition both financially and from the point of view of the exhibitors. The R.M.A. also participated in the Manchester Radio Exhibition, and a wireless section is being organised in the next Ideal Home Exhibition. It is hoped to organise an exhibition in Glasgow in 1931. Co-operation with other bodies has continued, and particular mention is made of the liaison committee formed to keep in touch with the British Radio Valve Manufacturers' Association. The Radio Trade Committee on Broadcasting has been active. A scheme has been prepared, in conjunction with the B.B.C. and the B.R.V.M.A., with the object of assisting educational organisations to obtain and maintain apparatus for the reception of educational programmes. A pamphlet relating to the use of mains power for radio sets is being prepared, and an arrangement has been made with the Post Office to insert a clause dealing with the subject in wireless licences. After considering proposed amendments to the I.E.E. Regulations upon this matter, the Association recommended that no revision should be made. The Association is in communication with the Electricity Commissioners regarding the changing of mains apparatus upon the conversion of supply from d.c. to a.c. After considering, with other associations in the industry, the question of a radio trades benevolent fund, it was decided that the Electrical Trades Benevolent Institution should be approached with a view to its covering the radio industry as well. Owing to the clashing of the date of the proposed inquiry with the Radio Exhibition, it was decided to withdraw the application for a marking order in respect of imported radio apparatus, on the understanding that it might be renewed at a later date. The membership of the Association is now 152 and the accounts disclose a very satisfactory financial position.

In accepting the presidency for a further term, Sir WILLIAM BULL said that, while he appreciated the honour accorded to him, he thought that the Association should consider the election of somebody more intimately associated with the industry. Mr. J. T. Mould said that the Executive Council would consider Sir William's advice.

Several questions were raised under the heading "Other business." The subject of the duration of the 1930 Radio Exhibition was discussed. It was resolved that this should be left to the free discretion of the Exhibitions Committee, after a proposal to limit it to seven days had been put forward. The subject of the agreement with the Marconi Company was raised, and Mr. Mould said that it was the best which could be obtained. It was not binding upon the members who were free to negotiate better terms if they could. A member suggested that the B.B.C. should be approached with regard to the advertising of special programme items. Mr. Mould said that the B.B.C. had been asked to broadcast special programmes during Radio Week but the suggestion had not been received very sympathetically. Upon a suggestion that an association, on the lines of E.D.A. or the Telephone Development Association, should be formed for the radio industry, Mr. BOWYER-LOWE said that the Association should do that kind of work and, in fact, by organising a Radio Week, was already doing something of the sort. It was suggested that manufacturers should get together to study means of eliminating price cutting. Mr. Mould said that while the Association could not control prices, it was within its power to assist members to maintain the prices which they had fixed. The Radio Wholesalers' Federation and the Wireless Retailers' Association had already come to an agreement in this matter and they had approached the R.M.A. with a view to securing its aid.

At a subsequent luncheon brief speeches were made by Sir William Bull and Mr. Mould, and the election of the following to the Executive Council was announced:—Bowyer-Lowe Co., Ltd.; Brownie Wireless Co. (of Great Britain), Ltd.; Burndept Wireless (1928), Ltd.; Chloride Electrical Storage Co., Ltd.; Climax Radio, Ltd.; Columbia Graphophone Co., Ltd.; Dubilier Condenser Co. (1925), Ltd.; Ferranti, Ltd.; General Electric Co., Ltd.; Graham Amplion, Ltd.; Hart Collins, Ltd.; Igranic Electric Co., Ltd.; Kolster-Brandes, Ltd.; L. McMichael, Ltd.; Marconiphone Co., Ltd.; Mullard Radio Valve Co., Ltd.; Pye Radio, Ltd.; and Radio Instruments, Ltd.

Naval Assistance Refused.

One part of the United States has been so dry lately that two towns owning hydro-electric plants (Seattle and Tacoma) have been unable to maintain an adequate supply of power. They accordingly asked the U.S. Navy Department to let them have power from the Aircraft Carrier *Lexington*, which has a 212,000-h.p. generating plant. The request was refused.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New Lighting Fittings.

A new enclosed lighting unit employing special glassware designed to give an illumination approximating to that of natural diffused daylight is the "Eralite" fitting, fig. 1, which has recently been produced by Messrs. Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4. The glassware used in this fitting has been designed upon a scientific basis to correct the light from the lamp, and when used in conjunction with modern electric lamps produces artificial illumination with a high degree of approximation to natural light. The light from the "Eralite" globe is intense, pleasing and free from glare, and does not emit any of the

Fig. 1.—The "Eralite" Fitting.

Fig. 2.—A "Da-Ray" Unit.

light rays which are harmful to the eyes. It is claimed that colours are seen virtually in their natural tones, and that the general light effect is pleasing in character and lacking the coldness usually associated with filtered light.

Fig. 2 shows the "Da-Ray" unit recently introduced by the Wholesale Fittings Co., Ltd., 23, 25, 27 & 37, Commercial Street, E.1. These fittings are the outcome of numerous experiments with "Supastone" 3-ply glass, which has attained a well-deserved popularity, as in addition to avoiding glare, the absorption factor of "Supastone" is extremely low. "Da-Ray" units give a natural diffused daylight effect, a photometric test showing a remarkably even distribution of light. The units are supplied in three sizes with 8 in., 12 in., and 14 in. diameter glassware.

A High-Voltage Indicator.

The "Martindale" high-voltage indicator, a product of Martindale Electric Co., Ltd., The Hyde, Hendon, N.W.9, consists of a highly sensitive neon discharge tube, designed for long life, equipped with special electrodes and assembled in a sturdy glass housing, capped with substantial brass ferrules. It will glow when subjected to comparatively low voltages and with the passage of an almost infinitely small current. Records show that an operating life of not less than ten thousand hours may reasonably be expected. The device measures 4¼ in. long by 7/16 in. diameter. There are two methods of installation: with and without ground connection. Both methods are identical, in that there is no connection between the charged cable and ground. Where no ground connection is used, the air clearance to ground provides the necessary insulation. Where ground connection is used, a heavy micarta sleeve placed about the cable gives additional security. In neither case can the cable insulation be stressed abnormally. Whether a ground wire is used or not, the tube draws its necessary power by condenser action. With a ground—and this method of installation is generally used on a.c. voltages up to about 4,000—the tube is set in the looped end of a metal strap which is in turn wrapped around additional micarta insulation placed about the cable. This strap acts as a condenser plate, and carries to the indicator a small current which jumps the gap, causing a glow, and then escapes through the ground wire. The current is only a fraction of a milliampere. On high voltages where no ground is used, the same thing occurs, but the final flow is from the brass cap on the end of the tube to ground. In this case, the end cap is one plate of an air-insulated condenser, the earth being the other plate.

A Tire-repair Unit.

Recent introductions by the B.E.N. Patents, Ltd., 92, Tottenham Court Road, W.1, include a tire repair unit. The former is made in two types: model A, which is portable, being mounted on a castor base tripod; and model B, which is designed for mounting on a bench. Both models employ a B.E.N. flexible-shaft drive, and the design of each is such that the motor swivel and the shaft are free to rotate through 360 deg.

Plug-type Oil Fuses.

The application of the single-pole plug-type oil fuse has been rapidly extended since its introduction in this country several years ago. To keep pace with the demand Messrs. Ferguson Pailin, Ltd., Bush House, Aldwych, W.C.2, have developed a design for 11,000-volt service and for the direct connection of bare copper conductors; this eliminates insulated cable tails and ensures a rigid connection. The main body of the fuse is of similar design to the original fuse, the chief exception being in the terminal arrangements. Each terminal consists of a bakelite-insulated copper stem, the external portion being protected from the atmosphere by a one-piece, 2-shed, petticoat-type, wet-process-method porcelain insulator. The internal end of the stem terminates in a compound-filled connection chamber fitted with an expansion cap. To minimise ground faults due to birds alighting on the unit, the bushing slopes downwards and the supporting straps are bolted to the underside of the connection chambers. Special precautions

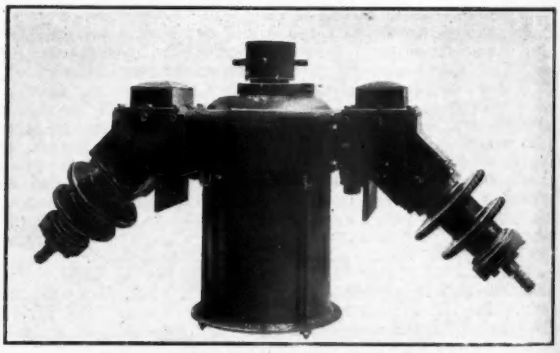


Fig. 3.—Complete Plug-fuse Unit.

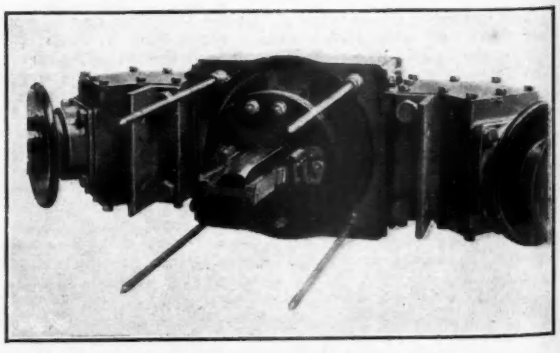


Fig. 4.—The Plug Portion with Cover Removed.

have been taken in the design of the bushings to prevent permeation of moisture and consequent breakdown of the insulation. Langite gaskets are fitted between all external clamping surfaces. Alternative designs are available for sealing cables or for terminating both cable and bare-conductor connections. Figs. 3 and 4 show, respectively, the complete plug fuse and the interior construction of the fuse portion.

An Electric Graining Machine.

Referring to the note under the above heading in our issue of November 29th, p. 972, the address of Messrs. GUY V. LAYCOCK, LTD., is 12, Cloth Hall Street, Huddersfield, not Manchester.

An All-insulated Switch-plug.

We have received from Messrs. G. H. PARSONS, LTD., Britannia Works, Tyseley, a sample 15-A all-insulated switch-plug. The plug portion, the switch cover and dolly are in bakelite or similar material, while the switch base, which carries the socket at the top, is in enamelled porcelain. The whole is excellently finished in brown. The cable entry for the plug is at the side, and the switch terminals, while arranged for back entry, are also both on one side. The switch carries an excellent quick-make-and-break action of the "under-lift" type, and the whole of the current-carrying portion is of substantial design.

A Stud Stump Extractor.

Messrs. H. A. MCQUEEN & Co., LTD., 182, West George Street, Glasgow, C.2, have introduced a specially designed tool for removing broken studs from castings, &c. It consists of a ratchet tool and drills and millers of various sizes to suit different sized studs. The idea is first to drill a hole down the centre of the stump, and then to apply a miller, which will bite into the stump and so unscrew the latter as the tool is turned.

New Day and Night Signs.

We learn that LIGHT RADIATORS, LTD., Medway House, Old Cavendish Street, Cavendish Square, W.1, have recently introduced a range of "Light Radiator" signs for which some novel features are claimed. The signs are on the daylight principle, but they can be electrically illuminated at night, a unique feature for van use. They are double sided, totally enclosed, and have readily replaceable stencils. A universal bracket has been introduced for use on the firm's small sign, and this enables the sign to be used for standing in a window, on a counter, attached to a wall or suspended from overhead.

A Float-type Battery-charge Indicator.

We have received from Messrs. J. H. COLLIE & Co., 10, Canning Place, Liverpool, a sample of their recent production, the "Guidor" hydrometer, a robust battery-charge indicator of the float type. The hydrometer proper has a coloured scale indicating "dead battery," "half charge," and "full charge," and a number of pin-point projections round the base prevent, it is claimed, sticking to the interior of the container. The apparatus can be supplied in glass or celluloid patterns. Each indicator is sent out packed in a strong carton with a metal screw-top lid.

An Improved Shade Gallery.

A development of the "Quickfix" dome shade gallery by Messrs. SPHINX ELECTRIC, LTD., Sphinx House, Hatton Garden, E.C.1, is the "Quickfix" serrated gallery. In this, serrations round the aperture through which the lamp-holder passes take the form of incisions in the metal, stamped at such an angle that by the mere pressure of the hand the lamp-holder can be passed through the aperture to its fullest extent, and there remain firm, it is claimed, without the application of any shade-carrying ring or other device whatever. To remove the gallery all that is necessary is to unscrew the gallery complete.

The Mishap at Nechells.

An official account of the recent explosion and fire at the Prince's generating station of the Birmingham Corporation.

MR. R. A. CHATTOCK, city electrical engineer, has issued the following account of the recent mishap at the Prince's generating station of the City of Birmingham Electric Supply Department:—

At midnight on Monday, November 18th, an explosion and fire occurred in one of the transformer cubicles, in which are housed the 3,500-kW single-phase transformers which step the pressure up from 5,500 to 33,000 volts for transmission through the 3-phase 12,000-kW trunk cables. Subsequent examination showed that one of the 33,000-volt terminal chambers on the top of the transformer had been blown to pieces, owing to the terminal having gone to earth through a bakelite bushing. The oil contained in the chamber and in the conservator tank above it was released and set on fire; the force of the explosion blew open the iron doors which are interposed between the cubicle and the outside yard, and the intense heat inside the cubicle, due to the blazing oil, burned the jointing between the valve and the transformer tank which is used for draining the oil out of the tank, so allowing the main body of oil in the tank to leak into the cubicle and feed the fire. The oil, unfortunately, found its way through some apertures in the wall, through which the cooling pipes pass, and started a fire in the chamber behind the cubicle, through which the control cables from the main switchboard to the e.h.p. switch cubicles pass, and so the control cables were burnt through and the operation of the switchgear was interfered with, thus entirely shutting the station down.

The Summer Lane station and the Nechells (temporary) station were immediately called upon, and the supply of electricity was restored in that way. The provision of temporary control cables was immediately commenced, and by 7 a.m. three of the turbo-alternators, one trunk cable, and all the e.h.p. cables were at work again, and by the following afternoon the whole of the station was in commission once more.

Fig. 1.—Exploded Terminal Chamber.

Fig. 2.—Damaged Cubicle Doors.

Fig. 3.—Temporary Control Cables.

The accompanying illustrations show (fig. 1) the exploded terminal chamber on the top of the transformer tank; (fig. 2) the effect of the explosion and fire on the cubicle doors; and (fig. 3) some of the temporary control cables that were laid during the night to replace those that were burnt out. Each of the control cables consists of a large number of cores, and each core had to be tested and connected to its proper terminals at either end, which work necessitated very great care and accuracy. The staff who handled it in the midst of the very trying conditions and surroundings are to be congratulated on the expedition and success with which it was carried out.

Selective Transmission-line Protection.

The Theoretical, Practical, and Financial Aspects of the Subject.

Report of an E.P.E.A. Meeting in London.

At a recent meeting of the London local technical group of the Electrical Power Engineers' Association, over which Mr. W. J. Jeffery presided, Mr. R. O. Kapp, B.Sc., M.I.E.E., lectured on the above-named subject, considering what reliance could be placed on selective protection, and the price that must be paid for the guarantee of continuity of supply afforded, respectively, by an alternative feed and selective protection.

When a fault occurred on a transmission system the resultant increase of current was not available for selective protection. On a complex network a faulty section probably carried less current than healthy ones, and any attempt to use the magnitude of current flowing to a fault would therefore operate against, not for, selectivity. Only if certain time delays were introduced would the mere use of overload relays be selective, and even then their field of application was very limited. The use of "tapered time limits" needed the installation of overload definite time-limit relays at the station and at each supply point on an outgoing line. Their time settings were arranged so that the one furthest from the generating station had the shortest operating time, and when a fault occurred all the relays would start to operate, but the one nearest to the fault would reach its tripping position first and clear the fault; thereupon, the remaining relays would cease moving and return to their original positions. Such protection was quite effective, if there were not too many supply points and only one feeding point, but as a rule the time settings near the generating station became excessively large. Allowing at least 0.4 second for the switch to clear the fault and an additional margin for uncertainty of operation, he did not think the time intervals of adjacent relays could safely be less than 0.7 second. With only four stations to protect, and allowing about 0.2 second initial time for a relay designed for the quickets operation and for the clearance time of the switch at the generating station, a fault near the station might be maintained for well over 3 seconds; that was too long for safe operation.

Against the very illusory advantage of long clearance times was the very real disadvantage that they were liable to cause rotary machinery to become demagnetised and consequently fall out of step, as did also any motors connected to the system, whereas its not inconsiderable quantity of energy stored mechanically and magnetically would keep the plant going if the fault were of short duration. The greatest permissible time was not easy of either theoretical or experimental proof. From tests carried out on the Bavarian 110-kV network it might be inferred that generating plant at least would remain in service if the fault did not last more than two seconds. A good deal of motor plant was likely to drop out of step during that period, however, rotary convertors being sensitive on account of the small amount of mechanical energy stored in them, and motor-generators because they could not relieve themselves of their d.c. load. No hard and fast rule could be made, but he suggested that on systems of any importance faults must be cleared in less than two seconds. A further disadvantage when protecting ring mains was the dependence on directional polarised relays, as it was not always safe to rely on voltage.

If protection by "tapered time limits" was the cheapest, crudest, and generally involved the biggest clearance times, balanced protective systems on the Merz-Price principle were at the other extreme; they were most expensive, but also most serviceable, had the outstanding advantage of very short clearance times, and did not depend on voltage either for operation or selectivity. A drawback was the charging current of the pilot cable, which tended to simulate a fault on the line and was more pronounced as the length of the pilot wire increased; therefore, the difficulties of applying balanced protection of a requisite sensitiveness increased with increasing length of transmission line.

Accordingly various refinements had been introduced, two of which deserved special mention: the split-pilot Reyrolle system was such that the effect of charging current in the pilot was self-neutralising, and the "Translay" Metropolitan-Vickers system introduced a compensating winding to make the relay inoperative to the charging current in the pilot; compensation could only be made complete for the fundamental frequency, and, therefore, harmonics in the wave form were liable to simulate a fault and produce false operation if the relay setting were very sensitive.

The high degree of sensitiveness of balanced protective systems was an achievement almost entirely British; it was, however, only of importance on circuits on which very small faults could exist, such as the windings of generators and transformers. When the dielectric stresses in the insulation were high the least failure must almost instantly develop into a very substantial fault. There could be no leakage or slowly-growing faults and, therefore, overhead transmission lines and very-high-pressure cables could not make use of a very sensitive protective system; but the habit of requiring a high degree of sensitiveness had become so ingrained that engineers were inclined to call for it even when it was not needed.

The chief drawback to balanced protective systems of the Merz-Price type was that of expense. When a very high degree of sensitiveness was required it was the only thoroughly serviceable system at present available, but when sensitiveness could not be made of cheaper systems would do, and of them the most promising was impedance protection, others being the split-conductor and parallel-feeder systems. Split-conductor cable was a good deal more expensive than an ordinary cable for the same carrying capacity, so this system had the same disadvantage of expense as the Merz-Price system. The cost of parallel-feeder protection was only that of the terminal gear and was, therefore, low, but it was operative only so long as both circuits were in service and some accessory form of protection, such as overload relays, was necessary to meet the case of one of the two circuits being switched out. Another restriction to its applicability was that tappings along the route could only be made if both lines were looped into every point, which meant that every tapping point must have four feeder switches and two sets of parallel-feeder protective gear, in addition to the switches for the outgoing supply; the minimum was likely to be a substation with six or seven switches, and tapping a line protected on the parallel-feeder principle was very costly. Another disadvantage of parallel-feeder protection of certain lines was the difficulty of ensuring operation if the fault were on one of the lines and near the end receiving the supply.

The various systems of distance, impedance, and reactance protection resembled the "tapered time limit" method in one respect. The aim of all impedance systems was to obtain as short a clearance time as possible, compatible with certain discrimination. It must always be remembered that there was a certain necessary lapse of time between the tripping of the relay and the clearing of the fault by the switch. The ideal was a relay which operated quickly when the fault was in its own section and as slowly as possible when the fault was outside its section, which ideal was attained by the quadratic relay of Messrs. Everett Edgcumbe & Co. in a very simple manner, and the same object was obtained by the ohmmeter relay of Messrs. Reyrolle & Co. in another way, while the Metropolitan-Vickers Co.'s definite impedance relay did not operate at all if the fault were much beyond the section to be protected, whereas its operating speed was great for close faults. These recent developments constituted a very marked improvement in the art of impedance protection.

Short sections could not safely be protected on the impedance principle, unless one was prepared to allow most of the running plant to fall out of step when a fault occurred; also there would not be enough voltage for the relays in the healthy sections to have any effect and those in sections adjoining a fault would then operate. For this reason, impedance protection was non-selective for very short lines, and he suggested that ten miles was a fair average.

When the sections of line were too short for impedance protection to be serviceable it was necessary in the present state of the art to employ pilot-wire protection. The balanced system was the most satisfactory for operating cables, but for overhead lines its cost was very heavy; the minimum that one could allow was £500 per mile. Pilot wires supported on the masts were cheaper, but the masts had to be higher and stronger to carry them and induced voltages when earth faults occurred might be great enough to break down the insulation and caused the resultant currents to simulate a fault on healthy sections, causing false operation. Many methods had been suggested for cheapening the pilot wire, including one developed by Mr. C. G. Carrothers and Mr. R. O. Kapp. A single copper pilot wire was employed in the earth wire of the transmission line. It was paper insulated, lead-covered, and replaced the steel centre coil of the earth wire; a non-crystallising lead alloy was used. That copper wire with earth return carried a continuous-current impulse on the occurrence of a fault, and directional relays at each end of each section operated to cause current to flow in the pilot wire in the direction in which the fault current flowed, *i.e.*, in the opposite direction from that employed by the inter-lock system. The continuous current caused the tripping of the switch at the far end of the section, provided the directional relay at that end pointed in the opposite direction. Relays pointing in opposite directions at the two ends of one section indicated a fault on that section, and it was only under those circumstances that the tripping of the switches could occur. If the pilot wire were destroyed when the fault occurred,

operation was not prevented thereby, because the terminal gear employed the method of duplex telegraphy, the tripping signals being given in duplex simultaneously from each end of the faulty line. The tripping circuit was closed at each end of the faulty line and nowhere else, whether or not the pilot wire existed on that section. Such an earth wire had a slightly larger diameter than an ordinary one, and the mast designer must take account of it, for it might increase the cost of the mast besides adding the cost of the earth wire itself. The extra cost per mile when employing that earth wire worked out at £100 per mile on a 132-kV circuit, and £30 per mile on a 33-kV circuit.

No pilot wire was needed for a method that had been applied successfully in the United States. The power lines themselves acted as pilots, the relay operation being obtained by means of high-frequency carrier current. There would seem to be great possibilities in that system, though at present he did not think it had reached the state at which it was very acceptable to the operating engineer. It depended upon the maintenance in working order of rather a large number of thermionic valves, and a system which might fail to clear a fault because some delicate part of the gear was not in working order was, in his view, wrong in principle.

There were now available a variety of different forms of protection, all of which looked very promising, but were all experimental. One might hazard a guess that when the perfect protective system arrived it would be on quite different lines from those along which they were at present moving.

Discussion in London.

Mr. W. J. JEFFERY, chairman, commented upon the satisfactory nature of balanced protection for high-voltage mains, the only dissatisfaction he had heard expressed by mains engineers being that they had very great difficulty in finding the faults which were tripped out by the protective apparatus.

Mr. A. E. DREW agreed that the Merz-Price system was extraordinarily reliable, but it failed to deal with any fault outside its particular section. In the event of a circuit breaker on that particular section holding up, there would be nothing to remove the fault. Similarly, impedance relays had been given a rising time characteristic, so that the further the relay was from the fault the longer the time which elapsed before it operated. That was rather a disadvantage, because if anything prevented the operation of the relays nearest the fault, the fault would not be removed. In one particular relay an attempt had been made to overcome that difficulty by the addition of an auxiliary disk, so that if the main disk failed to complete its travel the auxiliary disk would rotate and so ensured the operation of the relay.

Dr. A. H. ALLEN asked if it were really necessary to provide protection at all, because he understood that in Sweden protection was not provided against faults on high-voltage lines. The policy there was to provide against the occurrence of faults by adopting exceedingly high factors of safety, the number of faults experienced being very small indeed. One must bear in mind, of course, the saving effected by dispensing with protective apparatus, but the extra cost of providing particularly robust apparatus must be set off against that.

Mr. A. WATSON suggested that if no protection were provided, a fault would damage the line and the cost of repairing it would be serious.

Mr. R. O. KAPP, replying, said that the Central Electricity Board was still young, and protection was not the very first thing it had had to tackle, but the systems so far adopted were the Metropolitan-Vickers impedance system in Scotland; the Reyrolle reactance system in south-east England; for shorter lengths the "Translay" system in Scotland and the Reyrolle split-pilot system in south-east England; and his duplex system with an embodied pilot wire in the earth wire on a short line from Stockport to Macclesfield. The Board was investigating other possibilities, of course, and until it had had a few years operating experience of the grid it did not wish to take chances. On the British grid the protective systems were all designed to protect against phase-to-phase faults as well as against earth faults. The minimum cost of balanced pilots would be about £500 per mile in open country, where trenching was easy, but in towns the cost would be probably £700 per mile at least. The system using a pilot wire embodied in the earth wire might cost £30 or £100 per mile, according to the conditions. It was difficult, however, to estimate the cost per mile of providing impedance protection.

American Million-Volt Experiments.

The Use of a Portable Extra-high-voltage Generator for Testing Transmission Lines.

ENGINEERS who have been working every day this summer in Michigan with a million volts are collecting the first accurate full-scale information regarding the amount of corona loss and the time in which it occurs on electricity transmission lines. The experience of one of them well illustrates the corona effect. While other engineers were injecting million-volt charges into a transmission line at a point eight miles away, he sat on the running board of his motor car, adjacent to one of the voltage-recording instruments attached to a transmission tower. Suddenly he felt a distinct shock; his car, insulated from ground by the tires, had collected some of the electrostatic charge of the million volts, and that charge had escaped to ground through his body. Had it not been for the peculiar circumstances in which he had placed himself, however, he would not have received any shock. Engineers near other towers, even though miles from where the million volts entered the line, reported that they could hear a crackling noise as the h.p. charge passed along the line.

One of the first 110,000-volt transmission lines in the United States was installed years ago from the hydro-electric generating station on the Muskegon River at Croton, Mich., south to Grand Rapids, a distance of 45 miles. That line is now one of four high-voltage lines through the territory, and it has been found possible by the Consumers' Power Company this summer to hold the line as a spare, and it was therefore made available for a co-operative investigation with the Westinghouse Co. of high-voltage phenomena in which a new portable million-volt generator was used.*

Mounted on a motor track trailer, it somewhat resembles a fire-hose tower or hook and ladder. While being moved across country the appartus is held horizontally on the trailer and covered with metal hoods. Arriving at the spot where the artificial lighting is to be applied to the transmission line, the hoods are removed and one end of the rack is elevated by an electric motor and connected to the transmission wire overhead. On the rack are numerous condensers, eighty 25,000-volt units connected as a series of 40 pairs. By means of a transformer connected to the customary 110-volt lighting circuit, the condensers are charged and then discharged, practically instantly, in forty successive sparks from the bottom of the rack to the top, so that the final discharge into the transmission line is of a million volts. The apparatus is such that the charges can be "shot" into the line at the rate of about one each minute, and any desired number of such "shots" can be generated in rapid succession.

From Croton to Grand Rapids are two high-voltage transmission lines, and near the Croton station there is also a 140,000-volt line not connected to the station. Along the 140,000-volt line the Consumers' Power Company is collaborating with Purdue University in studying the effect of natural lightning on transmission systems and electrical equipment. For this work, which has resulted in obtaining two natural lightning records, is employed a hot-cathode oscillograph designed by Mr. R. H. George, research associate in the high-voltage engineering experimental station at Purdue University. The oscillograph is connected to the 140,000-volt line at the point where it passes nearest to the Croton generating station. So that it may be used for the work with artificial lightning on the second line, four additional transmission towers have been erected and strung so that the three wires of the 110,000-volt system can be led to the oscillograph. The instrument, then, can be connected to both the 140,000-volt line for obtaining natural lightning records during electrical storms and to the 110,000-volt line for recording the million-volt generator surges. In addition to the oscillograph, which records the exact characteristics of the million-volt wave as put into the line, sphere gaps are installed along the line for measuring the voltage drop as the surge extends over added miles of wire; and an automatic surge recorder further adds to the information the engineers are obtaining.

In conducting the investigations, the three wires of the transmission line are disconnected from the system and the portable generator connected to one wire of the line. With the oscillograph connected at the Croton end of the line, and the sphere gaps and surge recorder at other strategic points along the line, a switch is closed at the generator, there is a slight humming noise, and (in 60 seconds) a loud snap is heard as the line of condensers discharge into the line. The engineers at the different recording instruments make their

* See also p. 1072, this issue.

measurements and adjust their apparatus. The test is repeated many times, perhaps under varying conditions, and the different instrument readings are then collected and charted. In one series of tests 400,000-volt surges were repeatedly impressed on the middle wire of the three-wire system. The sphere-gap readings along the line showed that the voltage dropped from 400,000 at the source to half that value seven miles away, and to only 50,000 volts at a distance of 35 miles. At the same time the surge induced a voltage in the other two wires of the system of a value of from 100,000 to 140,000 volts at the source down to 50,000 volts at a point 35 miles away. This investigation, the first one on a large scale, showed how rapidly a high-voltage surge is dissipated, chiefly by the resistance of the line and the loss by corona. This type of surge is but one of several being studied this season in Michigan to determine the best method by which to protect the transmission system from damage by natural lightning. The new generator makes it possible to test lines at any place and to ascertain the amount of protection provided for them.

Kinema Lighting.

Particulars of the Installation at the New Tivoli Picture Theatre at Partick, Glasgow.

MANY new and interesting decorative features have been incorporated in the interior lighting scheme of the Tivoli Theatre, Partick, Glasgow. The general effect, whilst simple and dignified, represents a combination of decorative art, an idea of which may be gained from the illustrations below. Fig 1 is a view of the stage, proscenium, and organ grilles, from the back of the stalls; and fig. 2 is a view of the auditorium seen from the stage. Throughout the auditorium and on the stage lighting effects in four colours, or any combination of them, are obtainable by means of the dimming apparatus installed.

Four main lighting units are suspended from the ceiling over the stalls, these units being formed of double-tier rippled glass panels, each housing 48 lamps in four colours. The illumination of the proscenium front is secured by means of a continuous reflector which extends the full width of the theatre, involving upwards of 280 20-watt colour-sprayed lamps. This reflector is housed in such a manner that it is screened from the auditorium. Similar reflector lighting is provided for the organ grilles and over the front and back of the balcony. For the general lighting of the corridors on either side of the theatre, below and above the balcony, four-light ceiling fittings have been adopted, each lamp being of a different colour. Underneath the balcony three large ceiling fittings are suspended, each housing 16 100-watt lamps of four distinct colours. The under-balcony lighting effect is therefore contrived in a manner similar to the auditorium and over-balcony.

Fig. 1.—" Tivoli " Stage and Proscenium.

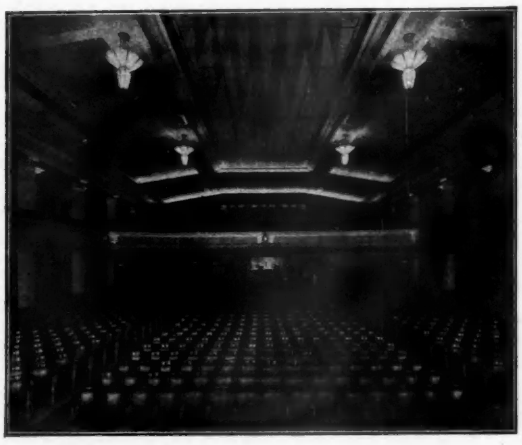


Fig. 2.—View of Auditorium from Stage.

Provision has been made for the illumination of the conductor's platform, which is formed of plate glass, trough reflectors equipped with lamps of four colours being fitted in a compartment beneath the platform, thereby permitting light, in any of the four colours or any combination of them, to be projected upwards

In addition to the ceiling fittings for general lighting, small trough reflector fittings have been provided for the illumination of the side corridors during performances. These reflector fittings are so designed and fitted as to be invisible from any part of the auditorium, and they illuminate the mural decorations on the side walls, which latter portray woodland and mountain scenery. In consequence, the illusion is created that moonlit woodland and mountain scenes are viewed through colonnades. It is one of the most novel systems of corridor pilot lighting yet impressed into the service of the picture theatre, and provides a striking decorative spectacle during the film presentations. Particular care has been exercised in the design of the pilot fittings for the lighting of the centre gangways in the balcony and under the balcony. They are so constructed that a beam of light is projected the full length of each gangway, whilst the source of light is entirely hidden from the view of patrons. Furthermore, this beam of light is so arranged that it covers the width of each gangway without the rays being directed on to the occupants of seats adjacent to the gangway.

A number of large ceiling fittings, *en suite* with the auditorium units, are installed in the covered forecourt at the entrance to the building, whilst the entrance hall is lighted by means of demi-coupe wall brackets and illuminated lead-glass panels, the latter representaing mural decorations.

The equipment of this theatre, from a lighting and decorative point of view, is quite different, it is claimed, from anything that has hitherto been installed in this country. The architects were Messrs. Denny & Blain, and the consulting engineer was Mr. Alexander Ramsay. The electrical contractors were Messrs. Primrose & Primrose, Ltd., the special electric lighting fittings being designed by the General Electric Co., Ltd., in consultation with the architects and the engineer.

Journal Bearing Practice.

Mr. Francis Hodgkinson, of Philadelphia, U.S.A., recently submitted a paper to the British Institution of Mechanical Engineers in which he considers principally the problems of bearings for such machines as dynamos, motors, steam turbines, and the like, when flooded lubrication is applied and the machinery must be placed in operation with the full load on the bearing. An important factor is knowledge of the centrifugal action of the lubricant when it is squeezed between the surfaces; that is to say, the fan-like path of the oil particles when subjected to pressure, and the relative motion of the surfaces. In this respect there would seem to be room for research, but, even without it, the author has no hesitation in affirming that the bearing loads which are common practice to-day may be much increased, with a slight gain in overall efficiency of the machinery and in many cases a substantial shortening of turbine generator sets, motor-generator sets, &c.

The Rationalisation of Industry.

Some economic aspects of, and ideas regarding, the commercial development of industry as affected by existing conditions, which have grown up since the 1914-18 European war.

By S. B. HASLAM.

(*Extracts from chairman's address before the* WESTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE general trend of industry to group and amalgamate provides problems which are more vital and more deeply seated than any others. The work of the Central Electricity Board is a noteworthy example of grouping. What the result will be time alone will show, but it may be taken for granted that for the present the supply side of our industry is being tackled in a comprehensive manner; on the manufacturing side some drastic reorganisation will be necessary if we are to maintain our position, compared with foreign rivals. It is difficult to decide on the importance of the foreign market; generally, export business is not, in itself, remunerative to any manufacturer, but nevertheless it is of paramount importance in that the load factor of the factory can be considerably improved thereby, with resulting benefits to the home market and to the manufacturer's own cost of production.

During the last three years electrical plant export business was divided almost equally between this country, the United States, and Germany; unfortunately, in 1928 both of our competitors secured a slightly larger share than us and, if we remove from the total export figures the value of the electrical goods sent to other parts of the British Empire, our share of the foreign trade compares very badly with those of our chief competitors. In this connection an article recently published* is of interest.

To students of the general industrial situation the most noteworthy feature has been the wonderful revival of Germany in the past three or four years, the cause of which may be summed up in the one word "rationalisation." The maintenance of prices, or the elimination of competition, is not part of the scheme. Rationalisation is understood as "The methods of technique and organisation designed to secure the minimum waste of either effort or material." It includes the scientific organisation of labour, "standardisation both of material and products, simplification of processes, and improvements in the system of transport and marketing."

Financial conditions forced its development in Germany before the necessity became so overwhelming in this country. Rationalisation was first applied to the coal industry, and later spread to the electrical, chemical, artificial silk, and textile industries, and the principal results may be summarised as follows:—

(*a*) A rise in individual output following the closing of the less efficient mines and works, the concentration of full-time production in those best adapted for preservation and extension, and a rapid progress in the modernisation of plant.

(*b*) A steady improvement in the physique and morale of the workers, due to the rise in wages and standard of living.

(*c*) The elimination of duplicated activities and other forms of waste of labour and plant.

(*d*) An immense reduction in transport costs, due to the allocation of production to particular works for particular purposes and centralised control of the movement of raw materials and finished goods.

(*e*) An advance in full utilisation and progress in general technical and scientific practice and further concentration of sales organisations.

While it is not possible at this period definitely to say that the improvements in German industrial conditions are permanent, there is very substantial evidence that they are founded on solid ground. Fundamentally, the Englishman is not temperamentally suited to rationalisation; he is by nature and upbringing an individualist. Amalgamation with one centralised organisation tends to split up the organisations into sub-divisions, each dealing with a particular portion of the industry; the effect is "mechanisation," and the human element becomes reduced to a minimum. The old capable all-round business man in charge of the whole business is rapidly giving place to the young departmental head specialising in his own particular branch, but, unfortunately, too often he has not the advantage of a general all-round training, and therein weakness lies. Standardisation and specialisation of both industry and labour undoubtedly tend towards the cheapening of a commodity and a higher efficiency in organisation, but they also lead to a much larger number of purely routine workers and a shortage of all-round experienced leaders. The ultimate measure of success will depend largely upon whether this weakness of modern organisation can be overcome; otherwise our industries will in the future be dependent on an army of specialists who will know very little themselves of the actual internal organisation of their own concern.

The system which has proved so successful in Germany is being put into practice in this country in most of our industries. Time alone can show what the results will be, but it is to be hoped that those who control and direct the combines will realise that the object to be aimed at is economy and, therefore, lower prices, coupled with higher wages and better working conditions.

If rationalisation, complete or in a modified form, when put into operation in this country produces results similar to those obtained in Germany, increased production will result. This country cannot absorb such an increase and, therefore, markets in the Dominions and Colonies and abroad must be found, and, when found, retained. Political activities will undoubtedly have considerable bearing on this problem, but when all is said and done the two chief factors will be the salesman and the publicity man.

It is my very definite opinion that it is to the salesman that our industries must look if our old-time pre-eminence in engineering development is to be recovered. This applies chiefly to the foreign markets, which become more and more of vital importance. The man sent out to get orders must be carefully selected; he must be a skilled trained engineer with a good and definite personality; he must be able to examine and advise on the work to be done; to calculate and guarantee the time of performance; to set up and start the plant when delivered, and, finally, by actual demonstration, if necessary, to prove that his statements and advice were correct. In other words, only the best trained and equipped men should be selected. When, in addition to the qualifications above mentioned, it is realised that for foreign business the salesman or the commercial engineer, must know at least two foreign languages and speak and write them fluently, and must also study the manners and customs of the country in which he operates, it will be realised that his is no easy task and, therefore, is all the more worthy of encouragement. He must put himself in the place of the man at the works who reads his reports and enable him to grasp what is wanted in the way of design and estimate, while the manufacturer must place implicit confidence in those reports, and must remember that the man on the spot knows the local conditions, and should those conditions call for re-design he must be prepared to re-design if he wants his share of this business.

One of the benefits to be derived from amalgamation will be the restriction of advertisements, and the money thus saved will prove of inestimable value, whether put back into the industry for research and development, or given to the public by way of reduced prices. Of course, these remarks do not apply when dealing with foreign trade, as in that case foreign competition has to be met. For the home markets the propaganda work carried out by the British Electrical Development Association can be relied upon to do what is necessary to increase the number of users of electricity, and it is my serious suggestion that greater support of that Association by manufacturers and supply authorities will give good results, and at the same time materially reduce the individual advertising allocations of the subscribers.

In our industry reorganisation on rational lines is necessary on the production, distributing, and operating sides. Old-fashioned methods must go, and a new vision must materialise. The danger of amalgamations genuinely formed for better and cheaper production becoming debased into price-maintenance cartels must not be overlooked. Another danger lies in the suppression of individual thought and effort; it is that which distinguishes British goods all over the world. The standard of commercial engineering must be raised and recognised, and both manufacturers and users must realise that it is only by co-operation that the industry can survive the great trade struggle between this country and its foreign rivals which is now commencing. The next few years will witness competition from abroad the like of which has never yet been seen; we need not fear it as regards quality; we can meet it in price, if we realise what we have to do and set about it. We can regain the markets of the world, if we abandon our somewhat insular methods and appreciate that the man who pays the piper has a right to call the tune.

* "The World's Electrical Exports," ELEC. REV., 1929, Vol. 105, p. 515.

Transmission Line Surges.

Over-voltage transient phenomena due to lightning and switching disturbances an apparatus used for their investigation.

(Extracts from a lecture delivered before the INSTITUTION OF ELECTRICAL ENGINEERS.)

IN the course of his lecture on the above subject Dr. H. NORINDER pointed out, *inter alia*, that lightning surges on high-voltage transmission lines had always been troublesome, and the importance of the problem had increased with the general development of long-distance high-voltage transmission. The yearly losses due to lightning thus tended to become higher with the extended use of electric power for such purposes as railway working, because the economic effect of the interruption of the supply due to lightning would be much more serious than when used for less important purposes. Therefore the problem of protection against lightning surges was of no small economic consequence.

The earlier methods of dealing with lightning surge problems were now antiquated and primitive, and the whole problem had been transferred to a region wherein purely scientific methods could and must be applied. The adequate construction of lightning surge protective devices involved an exact and full acquaintance with the source of the trouble, the natural lightning surges themselves.

The development during the past 15 years of high-vacuum technics in general had led to the construction of special devices for research into the effects of lightning on transmission lines. There were now three groups of instruments that provided possibilities for rational research into lighting problems. They were klydonographs, cathode-ray oscillographs, and lightning surge generators. A cathode-ray oscillograph, on the one hand, with its accessories in the form of kenetron rectifiers, oscillator circuits, and evacuation systems, represented quite a laboratory. The klydonograph, on the other hand, with its astonishingly simplified construction, represented quite the reverse. The main part of the klydonograph was a small insulated electrode which was pressed against the sensitive layer of a photographic plate, whose other side was covered by an earth-connected metal plate. In the case of the cathode-ray oscillograph the cathode rays impinged on a photographic plate, or film, situated within the vacuum tube of the oscillograph. The intense bombardment of the electron jet on the photographic plate made it possible to record transient phenomena during parts of a millionth of a second.

Both the klydonograph and the cathode-ray oscillograph were instruments by which lightning surges could be observed, either as they were produced in a natural way on transmission lines under full load conditions, or in an artificial way in a laboratory circuit. They, therefore, could be regarded as controlling devices for lightning surges.

In the case of the surge generator, however, one had a producing device for surges under controlled conditions.

The simplicity of the klydonograph was one of the reasons for its widespread use on transmission systems, but, whilst it gave the amplitude and polarities of the surges, it failed in recording phenomena with time variations of a few microseconds. Nevertheless the klydonograph represented a very reliable control instrument for surges on transmission-line systems, and Dr. Norinder considered that it was worthy of more extended use.

The only suitable device for obtaining complete records of lightning surges, however, was the cathode-ray oscillograph, but the main difficulty in its use was the impossibility of foretelling the time of arrival of the surge. For that reason the oscillograph must be kept ready to record perhaps for an hour or more and during that time the film must be protected from the cathode beam and its stray radiation. Without such precautions the rays would blacken the film within a fraction of a second and no trace of a record would be visible. Further, even when a record had been taken, the film must still be protected against the radiation from the electron beam.

That special problem could be solved in two ways: in both cases the cathode ray was kept at its normal strength in the instrument during its whole time of exposure. The beam was prevented from striking the photographic layer by a special beam-blackening device, consisting of an external relay which was tripped by the first arriving impulse of the surge; the relay, which made the record, consisted of a set of electron tubes, but was too complicated in Dr. Norinder's opinion and created a great deal of difficulty. Therefore, he had devised another method in which he used the electron beam itself in the oscillograph to give the relay function, and it was claimed that it gives much quicker results, the whole effect being given by the electron beam of the oscillograph.

The construction of surge generators offered some difficulties with regard to high-voltage insulation and the elimination of superimposed high-frequency from the circuits. The voltage of kenotrons was limited to about 200 kilovolts, but for a surge generator it was sometimes necessary to go up to more than ten times that value. Another inconvenience was the necessity for relatively high effects in the lightning generators. A device for overcoming these difficulties, which had been developed by the American Westinghouse Electric & Manufacturing Co., was described and illustrated. The generator consisted of several groups of condenser banks, spark gaps, and resistances, and was claimed to have shown great flexibility as a lightning surge generator. The condensers were charged from a kenotron rectifier over resistances of the order of one megohm. One of the spark gaps was set to about 20 per cent. lower spark-over voltage than the other ones, and by the regulation of the voltage of the rectifier, a very high voltage could be reached in the system. Two of the condenser groups got a higher voltage than the others, and the spark gaps of those groups were immediately broken down. The device was diagrammatically illustrated, and photographs were shown of such a generator for 3.5 million volts in the high-voltage laboratory of the American Westinghouse Co., and also of a portable lightning-surge generator for one million volts, which was used last summer for artificial surge generation on a 220-kilovolt line.* Oscillograms were also shown indicating the regularity of the voltage variation, one record of 2,000 kilovolts being specially pointed out as showing the voltage rising to its full value within a half micro-second.

Dr. Norinder then discussed external arrangements for the connection of oscillographs and klydonographs to transmission lines, and pointed out that one of the predominant advantages of the klydonograph and the cathode-ray oscillograph was the relatively small effects necessary to produce the records. That fact permitted of the connection to a high-voltage line being made by means of capacities. It was possible, he said, to use a string of insulators in the form of a potentiometer, precautions being taken with regard to proper oscillations in the circuit leading to the oscillograph. The influence of leakage over insulators during rain and disturbance by corona must also be avoided, which could be done by using aerial air condensers in the circuit. Sometimes insulator strings suspended within the laboratory had been used in combination with air condensers. A view of such an outdoor arrangement in connection with transmission lines at Uppsala was shown, as was also an arrangement of potentiometer rings used last summer by the American Westinghouse Co. at its lightning research laboratory in New Gersey on a 220-kilovolt line.

One of the difficulties when connecting a cathode-ray oscillograph to a transmission line under full load was the elimination of the normal load voltage which was impressed on the deviation system of the oscillograph. One method was to use a relatively wide target. The normal voltage in such a case was so regulated that the electron jet would oscillate over the target under normal load voltage and only an excess of the normal voltage would cause the jet to go off from the target and strike over the film. Sometimes it was convenient to use a non-inductive resistance above the condenser of the instrument.

Dr. Norinder then went on to discuss electro-physical conditions of lightning-surges, *viz.*, surges by direct strokes and surges by induced charges, and pointed out from a physical point of view how there was a distinct difference between the two. In that connection he referred to Dr. G. C. Simpson's twentieth Kelvin lecture on this subject before the I.E.E. last session.

The final part of the lecture gave experimental data on the rate of cloud discharge, together with characteristic records of the discharge rate, all of which were accompanied by a number of illustrations. In conclusion, it was stated that it was not possible to obtain definite data of lightning surges from the records that had been exhibited, and therefore a great deal of caution was necessary in interpreting the results. Much work still remained to be done to make the knowledge of the subject more complete and definite, and it was suggested that one would always be faced with results which would vary in their general aspects as greatly as the physical conditions that governed them, *viz.*, the thunderstorms themselves. At the same time it would, said Dr. Norinder, be possible by further research to determine more efficient methods for relieving transmission lines from the troubles caused by lightning, at any rate in a very large number of cases, if not in all. The first thing necessary was rational research on surges under normal conditions in transmission lines; next to reproduce the surges under normal controlled conditions, in order to study their influence on distribution systems. Only by working in that way was it possible to ascertain if protective devices against lightning surges would be effective.

Dr. G. C. SIMPSON said that Dr. Norinder had done most

* See p. 1069, this issue.

important work on this subject, but, unfortunately, it was usually published only in the form of glimpses in English publications. One of his most important papers was published only in Swedish, and there had been the greatest difficulty in getting it translated. Dr. Norinder began as a pure chemist, and his first work was on atmospheric electricity. Since then he had been "captured" by engineers, and, as a consequence, had not done anything like so much useful work as a pure physicist. Nevertheless, he had done some extremely valuable work with regard to lightning surges.

Mr. B. L. GOODLET, having read the majority of the papers that had been prepared by Dr. Norinder, felt nothing but admiration for the pioneer work he was doing. There had been a good deal of work done in America and Germany with the oscillograph in connection with lightning surges, but most of it had been inspired by Dr. Norinder; most of the apparatus used incorporated details due to him. It had often been said that in England they were not paying much attention to the problem of lightning surges and transient phenomena, and that there was no impulse generator available in this country suitable for such work It was certainly true that a great deal more work had been done abroad on the subject than in England, but it was nevertheless the fact that something was being done in England. Mr. Goodlet showed a lantern slide illustrating an impulse generatoor which had been used for charges up to 1,500,000 volts, the highest voltage used in England so far. The apparatus was at Trafford Park, Manchester. Another lantern slide showed an impulse spark of over one million volts on an insulator chain, which was a duplicate of those now being used on the Scottish grid. Another lantern slide depicted the first cathode-ray oscillogram taken in this country with a voltage of one million, the duration being one-millionth of a second.

On the motion of the PRESIDENT (Sir Thomas F. Purves), a hearty vote of thanks was accorded to Dr. Norinder for his lecture.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

East Sussex Cables.

Last week Mr. MARJORIBANKS asked the Minister of Transport whether the Central Electricity Board, for the sake of preserving rural amenities, would consider the laying of underground cables instead of overhead lines in any part of the work about to be undertaken in East Sussex under the Electricity (Supply) Act, 1926, either along the main or subsidiary lines of supply.

Mr. MORRISON said he had no reason to doubt that the Board would consider all reasonable methods of erecting its lines so as to interfere with amenities as little as possible. No lines might be erected above ground without his permission, and before that permission was granted careful consideration would be given to the views of the local authorities interested.

Electrical Power in Rural Areas.

Major GLYN asked the Minister of Transport last week whether he would state the policy of the Government with regard to the establishment of efficient services of electrical power and transport in rural areas.

Mr. MORRISON said it was his desire that cheap and efficient services of electrical power and transport should be provided as far as possible in rural areas. According to his information, over 70 per cent. of the rural population was at present included within areas with an authorised supply of electricity, and applications in respect of a considerable proportion of the remaining areas were pending.

Overhead Wires Near Aerodromes.

On December 3rd Mr. EVERARD asked the Postmaster-General whether he would arrange that all telegraph and telephone wires adjoining the aerodromes of municipalities and light aeroplane clubs should be put underground.

Mr. LEES-SMITH said he was always willing to make the best arrangements practicable for diverting to underground, or to another route, overhead telegraph and telephone wires in the vincinity of aerodromes, provided that the owners of the aerodromes would bear the expense.

Wireless-telephony.

On December 3rd Sir ROBERT HAMILTON asked the Postmaster-General whether any advance had been made with the perfecting of wireless-telephony in a manner that would make the system applicable for intercommunication between islands.

Mr. LEES-SMITH said that experiments with wireless telephony had been undertaken, but up to the present the results had not been altogether encouraging. Experiments were being continued, and advantage would be taken of any development in wireless communication which might render feasible its use for intercommunication between islands.

London Subway Fires.

On December 4th Mr. DAY asked the Minister of Transport whether the Electricity Commissioners had come to any arrangement with the London County Council in view of the jury's rider in the investigation held into the two London County Council subway fires which occurred in September, 1928, in which it was stated that the London County Council's electrical system was obsolete and dangerous; and could he say whether his Department proposed to take any action for the purpose of minimising similar gas explosions in future.

Mr. MORRISON said the Electricity Commissioners informed him that the London County Council had adopted a new system of electric lighting for the Victoria Embankment, the supply being at low pressure and involving a new system of cables laid under the footway and the removal of the old lighting cables from the subway. So far as his Department was concerned, no further action was being taken at present.

Hereford Electricity Undertaking.

On December 4th Mr. MUGGERIDGE asked the Minister of Transport whether the Electricity Commissioners sanctioned the recent sale of the city of Hereford's electricity undertaking to a company or trust; whether he had knowledge of offers being made to acquire other municipal undertakings, and, if so, which; and what steps he proposed to take to safeguard the cheap distribution of electricity throughout the country, as distinct from its cheap generation, which was one of the main objects of recent legislation.

Mr. MORRISON replied that the Electricity Commissioners informed him that they had decided to hold a local inquiry before coming to a decision in this matter. With regard to other municipal undertakings, he had seen various references in the Press to proposals for acquisition, but he understood that no application for consent to any such transfer was before the Commissioners. With regard to the last part of the question, the Commissioners would not sanction any such transfer unless they were satisfied that it was accompanied by technical proposals conducing to the cheaper distribution of electricity.

Special Orders.

On December 4th Sir DOUGLAS NEWTON asked how many Special Orders for the supply of electricity were now under the consideration of the Electricity Commissioners; and what was the average time taken in getting such orders through.

Mr. MORRISON said he was informed that there were 70 Special Orders at present under consideration by the Electricity Commissioners. The average time taken in getting such Orders through, including the stages of confirmation by the Minister of Transport and approval by each House of Parliament, was between 12 and 15 months.

The Battersea Power Station.

On December 5th Sir SAMUEL HOARE asked the Minister of Transport if he could assure the House that the London Power Company would not be authorised to proceed with the full scheme of the Battersea power station until the Government chemists had made their further report, and unless that report made it clear that the danger of sulphur fumes had been eliminated.

Mr. MORRISON said that the full scheme would not be sanctioned until the committee presided over by the Government chemist had made its further report, and it was clear that adequate measures could and would be taken to avoid the dangers which might arise from sulphur fumes.

Ultra-violet Rays.

On December 5th Lieutenant-Commander KENWORTHY asked the Minister of Health, whether, in view of the differences of opinion among responsible medical authorities as to the value for tonic purposes of ultra-violet light, he would institute a full and impartial inquiry into the whole question of the value of this treatment.

Mr. GREENWOOD said the value for tonic and therapeutic purposes of ultra-violet light had formed part of the routine inquiries which had been made during recent years by medical officers of the Ministry of Health, and recorded in the annual reports of the Chief Medical Officer. Those observations were being continued, and he did not see any necessity for a fuller inquiry.

The Co-ordination of London Transport.

Last week Mr. H. MORRISON, Minister of Transport, informed Mr. Thurtle that the Government had secured the services of Sir William McLintock to act as adviser upon financial matters connected with the scheme for the co-ordination of London passenger transport.

The Grampian Hydro-electric Power Bill.

After considering this Bill for nine days, the Select Committee of the House of Lords found the preamble "not proved." The Bill had the support of the Central Electricity Board and the Electricity Commissioners, but was opposed by the Mining Association and owners of fishing rights, &c., in the area.

Legal.

Fraudulent Consumption of Electricity.

AT Preston on December 4th Frederick Fazackerly, electrician, was fined 40s. for the fraudulent consumption of electricity. According to the evidence, the supply to the defendant's premises had been cut off owing to the non-payment of an account. The defendant broke the seal which had been placed on a fuse-box, replaced the fuse, and used electricity valued at 2s. 6d. He pleaded that he had a child ill in a room which was equipped for electricity only.

Ideal Wireless Co., Ltd.

MR. JUSTICE BENNETT, in the Chancery Division on December 9th, made an order for the compulsory winding up of this company on the petition of a judgment creditor for £320. The company did not enter an appearance.

Fellows Manufacturing Co., Ltd.

IN the Chancery Division on December 9th, Mr. Justice Bennett ordered the compulsory winding up of this company.

Mr. CHRISTIE, for the petitioners, said that they were judgment creditors for £418, and they were supported by creditors for, roughly, £2,000.

Mr. HARMAN said he appeared for the landlords on a claim for £145; and another counsel said he appeared for Marconi's Wireless Telegraph Co., and supported the petition.

The company did not enter an appearance.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Determining Efficiencies by Slide Rule Calculation.

I shall be glad if you will correct a misprint which occurred in my letter on the above subject published in your December 6th issue.

The commencement of the second paragraph should, of course, read "By this method, although (1—efficiency) is . . . ."

W. H. Watkins,
Grad. I.E.E.

London, *December 9th*, 1929.

Bowl Fires.

In your issue dated November 8th there is a letter signed by "Chromium" suggesting that makers of electric bowl fires should produce a chromium-plated bowl, which will greatly increase the popularity of this useful appliance.

We wish to point out to you that we have for some months past standardised chromium finishes as well as lacquered copper finishes for bowl and other types of fire.

Lane & Girvan, Ltd.,
J. FERGUSSON, *Director.*

Bonnybridge, near Glasgow, *November 26th*, 1929.

Designation of Wireless Batteries.

The increasing custom, due no doubt to competition in this market, of several low-voltage wireless battery manufacturers to list and mark such batteries showing only an ampere-hour (actual) capacity, without at the same time giving the hour rate on which this actual capacity is based, is very misleading.

To the technical reader there is a very obvious difference in the operating and monetary value of three l.p. batteries, each listed as 45 ampere-hours capacity, one being shown at a 10- or 20-hour rate, the second marked at 45 ampere-hours, actual, and the third at low discharge rate only. Price conditions to the layman at once suggest the purchase of the lowest priced 45 ampere-hour battery, shown as ampere-hours, "actual," or the one at a low rate of discharge, although, if the second or third were marked at the 10- or 20-hour rate, they might probably only be correctly shown as 30 ampere-hours, actual, or less. I suggest that the hour rate should always be given as well as the ampere-hour capacity, and that the use of the term "actual" should be discontinued as being misleading.

Why not also standardise the physical sizes of portable wireless batteries and thereby encourage mass production methods and lower prices to the consumer? I recently studied a prominent battery manufacturer's list of low-tension portable set wireless batteries where 42 different sizes were listed. The number of sizes might be limited to between six and eight.

Perplexed.

December 4th, 1929.

Transmission 50 Miles Costs 0.0235d. per Kelvin.

In the report of my remarks on page 973 of your issue of November 29th there is an incorrect figure (seventeen times the truth) and the load factor, which is essential, was omitted. At the Overhead Lines Association meeting I quoted a statement from *The Times*, p. 16, May 20th, 1929, by the hon. secretary of the Chelsea Society, an amenities organisation, that ". . . . the transmission of 50,000 kW, 50 miles at 80 per cent. load factor adds one fortieth of a penny to the cost of each kelvin . . . . given in evidence by Major Richardson and Mr. C. H. Merz, and emphasised by the chief Electricity Commissioner . . . ." quoted by Mr. Reginald Blunt from the public records of Viscount Younger's Select Committee of the House of Lords, on April 24th, 1929, on the Grampian Water Power Bill.

Theodore Stevens.

London, *December 5th*, 1929.

Two-part Tariff Prepayment Meters.

May we be permitted to correct a statement by Mr. W. Fennell in your journal concerning our two-part tariff prepayment meters.

The type we have been selling for the past two years does not require the consumer to pay a lump sum in advance. Each coin inserted is apportioned to the fixed charge and kWh charge. There is no fixed predetermined ratio, but the ratio is automatically adjusted by the meter to suit the conditions obtaining in each consumer's case, quite independent of the kWh consumption. This is not effected by an expensive or complicated clock, but by a simple and reliable Ferraris motor.

Since our meter is not a "creeping" meter, we do not see how the question of legality arises.

A.E.G. Electric Co., Ltd.,
W. HOWARD.

December 3rd, 1929.

We greatly appreciate the letter of Lt.-Col. H. W. Watts, of Epsom, regarding the "Rex" and A.E.G. methods of solving the problem of collecting by prepayment methods the fixed charge and current consumption charge, as we know that he has for years past accepted the importance of such a tariff to provide a means of supplying that immense section of the population which is of very modest means and cannot meet even an account of nine or ten shillings.

If one simply transfers the job of collecting a lump sum from the accounts department to the instrument before the consumer is allowed to use any current, one tends to defeat the original idea of the tariff, which is to provide an easy method of paying for the current consumed

It has been stated by an eminent central station engineer that consumers who had to be pressed for the payment of a 9s. account for a quarter's consumption, when placed on a prepayment basis have inserted regularly amounts exceeding 40s. every quarter.

The "Rex" meter has been evolved to provide a means of enabling prepayment consumers to avail themselves of the most encouraging tariff without the necessity of finding lump sums at any time. The method of achieving this is absolutely in conformity with all rules and regulations and is legally accurate.

A special point in favour of the "Rex" method is its flexibility. Supposing there is a fixed charge based on maximum demand or ratable value, &c., of 16s., and during a current quarter the consumer decides to use a cooker at 7s. per quarter, this amount is simply added when resetting the fixed-charge collector dial, making a total for collection of 23s., and as the "Rex" can be supplied with accommodation for a fixed charge up to 99s., there is ample scope for this method of application. This deals with this side of the account much better than an electrical device which is arranged to run at a standard speed, which may become a variable factor and necessitate skilled attention to alter its speed should the fixed charge amount be varied at any time.

It must also be appreciated that the "Rex" meter does not sum up an account against the consumer should he happen to be away or any other unforeseen matters arise.

It will be seen, therefore, that the "Rex" deals with the problems in a very human manner and enables the consumer to get a supply of current at any time by the insertion of one coin only, which is more likely to encourage the more extensive use of electricity than switching off his current and forcing him to find several shillings before he gets it on again.

Thompson & Co.

London, E.C.4, *December 6th*, 1929.

[This correspondence is now closed.—EDS. ELEC. REV.]

Standardisation of Sizes of Advertisement Pages.

There is another aspect than that of the convenience of the advertiser. I refer to that of readers, many of whom appreciate that there is much news and information in many advertisements. For many years past it has not been my practice to retain old issues of journals, but rather, as I read them, to tear out the technical articles and those of the advertisements that are likely to meet the need of present or future requirements. These extracts are then filed under the well-

known decimal subject-classification system, which has the advantage of a ready prepared index, and hence indexing, in the ordinary sense, is not required. My files are arranged for quarto size paper, and hence a large advertisement cutting has to be doubled. This means it takes more space on the file and also, on reference, is not so easily seen.

R. Borlase Matthews.

East Grinstead, Sussex, *December 6th*, 1929.

With reference to the letter of the I. S. B. A. appearing in the ELECTRICAL REVIEW of November 29th, 1929, p. 977, respecting the above, we are whole-heartedly in sympathy with this. We are advertising in a considerable number of trade journals, and our present block account is far heavier than it need be, due to the variety of size of trade journals. If these were standardised it would certainly free money for spending on extra space, expedite delivery of blocks to the publishers, and allow a change of copy more frequently.

Siemens Electric Lamps and Supplies, Ltd.,

W. W. WILLMOTT.

London, E.C.4, *December 3rd*, 1929.

Referring to the letter under the above heading appearing in your issue of November 29th, and in reply to the Editors' invitation for opinions on this matter, we would state that in our opinion the proposed standardisation of size of advertisement pages would be a big boon to all advertisers. There is no doubt that the varying sizes of journal pages very considerably increases the cost of this form of advertising, and we, for our part, would welcome a standard size of page.

Birkbys, Ltd.,

A. T. BIRKBY, *Director*.

Liversedge, Yorks., *December 6th*, 1929.

Science and Legislation.

Now that it is generally recognised that science must play a direct part in legislation, and no longer act merely in an advisory capacity, and now that there is a Science Committee in the House of Commons, an attempt is being made to set up similar committees in the Dominion House of Assembly and also in Australia. It is obvious that such developments must help in the development of the "new" industries, and it is hoped that all those who have had a scientific training will do all they can to further this development.

W. P. Dreaper, O.B.E., F.I.C.

London, *December 7th*, 1929.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

13,623. "Delayed-action electric relay device. J. Neale. May 9th, 1928. (Cognate application, 14,542/28.) (321,671.)

13,832. "Thermionic valve amplifiers." F. A. Mitchell. May 10th, 1928. (321,644.)

14,290. "Telephone repeater circuit arrangements." Callender's Cable and Construction Co., Ltd., and J. Urmston. May 15th, 1928. (Cognate application, 4,820/29.) (321,673.)

14,478. "Method of manufacturing insulated electric cables." J. E. Allan and S. B. Freeman. May 17th, 1928. (321,696.)

16,811. "Electric time switches." E. W. L. Cowan, W. E. King, and Measurement, Ltd. June 9th, 1928. (321,661.)

16,921. "System of automatic control for the generation of energy in an electric power plant according to a prescribed table." Akt. Ges, Brown, Boveri et Cie. June 11th, 1927. (292,086.)

17,099. "Apparatus for measuring the strength and direction of magnetic fields." J. G. Binny. June 13th, 1928. (321,647.)

17,404. "Thermionic valve circuits." Radio Frequency Laboratories, Inc. July 20th, 1927. (294,200.)

20,419. "Eddy-current brake." E. R. & F. Turner and F. H. Johnson. July 13th, 1928. (321,663.)

23,174. "Signalling indicators for use on vehicles." V. W. Restall. August 11th, 1928. (321,677.)

23,178. "Means for dissipating the heat generated by electrical apparatus immersed in liquid within a casing." British Electric Transformer Co., Ltd., and J. L. Thompson. August 11th, 1928. (321,678.)

23,206. "Starting apparatus for internal-combustion engines." A. E. White (Delco-Remy Corporation). August 11th, 1928. (321,653.)

23,248. "Street-lighting appliances." J. Bond, G. W. A. Illingworth, and W. J. G. Davey. August 13th, 1928. (321,654.)

23,285 "Method of mounting electric leads in thermionic valves." Dr. S. Loewe. August 17th, 1927. (295,689.)

23,407. "Electrical advertising apparatus." A. Zajdler. August 14th, 1928. (321,664.)

23,503. "Electric storage batteries or electric accumulators." S. C. Whaite. August 15th, 1928. (321,681.)

23,505. "Electric signal systems." Standard Telephones and Cables, Ltd., and A. H. Reeves. August 15th, 1928. (321,682.)

23,558. "Electric relays of the time selective type." Nalder Bros. and Thompson, Ltd., and C. L. Lipman. August 15th, 1928. (321,686.)

23,567. "Mounting of vibrating reeds, more particularly for use in connection with electromagnetic gramophone pick-ups, loud-speakers, and the like." P. Wilson. August 15th, 1928. (321,688.)

23,600. "Submarine cables." W. E. Beatty (Bell Telephone Laboratories, Inc.). August 16th, 1928. (321,710.)

23,616. "Inductance coils for wireless signalling apparatus." General Electric Co., Ltd., and W. H. Peters. August 16th, 1928. (321,711.)

23,726. "Systems of electric distribution." British Thomson-Houston Co., Ltd. August 23rd, 1927. (296,025.)

24,022. "Telephone systems." Associated Telephone and Telegraph Co. September 17th, 1927. (Addition to 293,294.) (297,318.)

24,757. "Television or like systems, and apparatus therefor." Universal and General Radio Co., Ltd., and L. M. Myers. August 28th, 1928. (321,750.)

24,911. "Slow-motion or fine-adjustment mechanism for electrical tuning apparatus." L. E. Fillmore and L. W. Fillmore. August 30th, 1928. (321,752.)

24,942. "Electric discharge devices." British Thomson-Houston Co., Ltd. August 31st, 1927. (296,411.)

26,674. "Thermionic amplifiers." L. E. Ryall. September 11th, 1928. (321,759.)

27,137. "Electrically-operated track switches." S. S. Stolp. September 21st, 1928. (321,766.)

27,786. "High-frequency amplifiers." C. E. G Bailey and Gramophone Co., Ltd. September 27th, 1928. (321,771.)

28,135. "Thermostatically-controlled protective devices for electrical apparatus." Siemens Bros. & Co., Ltd., and F. J. Gee. October 1st, 1928. (321,776.)

28,277. "Moving signs and advertising and like devices." R. H. Linton and M. E. J. G. De Bray. October 2nd, 1928. (Cognate application, 29,669/28.) (321,780.)

28,346. "Electric traction control systems." English Electric Co., Ltd., and F. D. H. Bremner. October 3rd, 1928. (321,781.)

29,601. "Electrical control systems." E. M. Johnson and Associated Electrical Industries, Ltd. October 13th, 1928. (321,300.)

30,869. "Electric signalling systems." Maschinenfabrik Oerlikon. November 29th, 1927. (301,418.)

30,910. "Multiple thermionic valves." Dr. S. Loewe and Dr. E. Roemhild. October 29th, 1927. (299,707.)

31,696. "Loud-speaker and like acoustic apparatus." C. French. October 3'st, 1928. (321,806.)

31,811. "High-tension switchgear installations in switch houses." Conduit Electrical Manufacturing Corporation. March 12th, 1928. (307,738.)

33,744. "Insulation of electric cables and conductors." J. McCallum. November 17th, 1928. (321,830.)

34,093. "Starting apparatus for induction electrical motors." P. L. Harlow and Associated Electrical Industries, Ltd. November 20th, 1928. (321,831.)

35,044. "Shade or globe holders and galleries." Benjamin Electric, Ltd., and G. Campbell. November 28th, 1928. (321,845.)

35,953. "Electric switches." G. Hezez and Soc. l'Appareillage Electrique de la Seine. April 12th, 1928. (309,532.)

35,959. "Ventilation of dynamo-electric machines." J. A. K Kuyser and Associated Electrical Industries, Ltd. December 6th, 1928. (321,853.)

36,966. "Toasters." British Thomson-Houston Co., Ltd. December 14th, 1927. (302,320.)

37,034. "Piezo-electric devices." Telefunken Ges. für Drahtlose Telegraphie. December 17th, 1927. (302,584.)

37,229. "Electric lighting systems for the headlights of motor vehicles." J. S. Ericsson. December 17th, 1928. (321,862.)

38,189. "Collecting electrodes for use in the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Metallges. Akt. Ges.). December 27th, 1928. (321,869.)

1929.

41. "Means for holding electric conductors, cables, and the like in position." Macintosh Cable Co., Ltd., and J. A. Smith. January 1st, 1929. (321,874.)

1,193. "Illuminating devices." W. Fantl. January 12th, 1928. (303,906.)

1,197. "Direction indicator for vehicles." A. Schwarz. January 12th, 1928. (303,909.)

3,157. "Electric resistances, rheostats, and dimmers." Curtis Manufacturing Co., Ltd., and F. C. Curtis. January 30th, 1929. (321,888.)

3,998. "Electrical braking systems for vehicles equipped with more than two electric motors." Forges et Ateliers de Constructions Electriques de Jeumont. February 7th, 1928. (Addition to 292,575.) (305,583.)

5,109. "Electric condensers." Elektrizitäts Akt. Ges. Hydrawerk. February 15th, 1928. (306,100.)

6,973. "Sealing cover for the cells of lead accumulators." Accumulatoren-Fabrik Akt. Ges. March 2nd, 1928. (307,294.)

8,043. "Process of manufacturing incandescent bodies." Naamloose Vennootschap Philips' Gloeilampenfabrieken. April 13th, 1928. (309,573.)

9,032. "Electrical transmission of pictures." British Thomson-Houston Co., Ltd. March 20th, 1928. (308,277.)

11,585. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 27th, 1928. (310,523.)

24,973. "Thermionic cathodes." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). June 13th, 1928 (Divided application on 297,028.) (321,665.)

25,232. "Electrical advertising apparatus." A. Zajdler. August 14th, 1928. (Divided application on 321,664.) (321,666.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 4th :—

Anthygron. Nos. 506,887, 506,888, 506,889, and 506,890. All goods in Classes 6, 8, 13 and 18.—Siemens-Schuckertwerke Gesellschaft, Siemensstadt, Berlin. (British representatives: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

L.E.C. Liverpool (lettering and design). No. 505,073. All goods in Class 8. —Liverpool Electric Cable Co., Ltd., Linacre Works, Bootle, Liverpool.

Autovorex (lettering and design). No. 507,512. Class 8. Radio-telegraphic and telephonic instruments and apparatus.—Marcel Tavernier, Montreuil-sous-Bois, Seine, France. (British representative: Henry Fairbrother, 30-32, Ludgate Hill, E.C.4.)

Metcosite. No. 505,449. Class 50. Compositions made from vegetable fibres and pulp, and articles made therefrom, including electrical insulators, junction boxes, lampholders, panels, bases and cases for electrical and wireless instruments, &c.—Merchant Trading Co., Ltd., 52, Bishopsgate, E.C.2.

B.S.S. for Solid and Split Taper Pins.

The British Engineering Standards Association has just issued B.S.S. No. 46, Part 3, 1929, for solid and split taper pins. This Specification forms the third part of B.S. Specification No. 46, which, in being revised, has been considerably amplified to cover all methods of keying. The Specification embodies requirements for the quality of material, together with the appropriate tests, and also gives a table indicating the standard sizes for both solid and split taper pins.

Copies of the above Specification can be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street London, S.W.1. Price 2s. 2d. post free.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ARDROSSAN.—Buildings at Academy (£32,000); master of works, Ayrshire Education Authority, Ayr.

ASKAM BRYAN (near York).—Alterations and extensions to farm buildings, for Yorkshire Council for Agricultural Education; Begg, Everard & Grierson, architects, 6, Millstone Lane, Leicester.

BARNSTAPLE.—Extensions, Plough Works, Alexandra Road, for J. Huxtable; Friend & Kelly, architects.

BILLINGHAM (Stockton-on-Tees).—Additional 600 houses; Industrial Housing Association (No. 3), Ltd.

BIRKENHEAD.—Development of Manor Hill estate; T. Wainwright & Sons.

BIRMINGHAM.—Telephone exchange and labour bureau, Staniforth Street and Corporation Street; H.M. Office of Works. Branch bank, Holyhead Street, Handsworth; Municipal Bank Committee.

BOLTON.—Office and store, Endon Street; Star Auto Engineering Co.

BRIDLINGTON.—Municipal offices (£43,000), for the T.C.; borough surveyor.

BRISTOL.—Central maternity clinic, Old Bread Street; medical officer of health.

BURNLEY.—Extension of Victoria Hospital (£20,000); secretary.

CARDIFF.—Extensions to Heathfield House Girls' Secondary School and pupil teachers' centre, for the Sisters of Providence (£30,000); William Ellis, 49, Deansgate, Manchester.

CARSHALTON.—Central school, Stanley Street (£22,500); Surrey E.C.

CASTLE DONINGTON.—Additional housing scheme, with electrical work, for the R.D.C.; surveyor.

CHALFONT ST. PETER (Bucks.).—Cinema; C. M. Street, secretary.

CHELMSFORD.—Sewerage and water supply schemes, Galleywood, with electrical work, for the T.C.; borough engineer.

CHELTENHAM.—Houses (64), Kipling Road; borough engineer.

COVENTRY.—Hospital for mental defectives; borough engineer.

CUPAR (N.B.).—Remodelling of Bell Baxter School (£30,000); executive officer, Fife Education Authority. Housing scheme (24), Balgarvie Road; borough surveyor.

DUNDEE.—Nurses' home, &c., at Baldovan Institution; MacLaren, Soutar & Salmond, architects, 15, South Tay Street.

EASTBOURNE.—Housing scheme (23 acres), Hampden Park; borough engineer.

ERITH.—Business premises, Pier Road, for F. W. Woolworth and Co., Ltd., Kingsway, London.

GLASGOW.—Buildings, Argyle Street, Buchanan Street, for Montague Burton, Ltd., Hudson Road Mills, Leeds; the manager.

HALIFAX.—Shops, offices, &c., Bull Green; borough engineer.

HIGH WYCOMBE.—Factory, Chairborough Road, for Peatey Bros. & Collins. Factory extensions, J. T. Edgerley, Frogmoor, and J. Cheese & Son, Newland.

HOLBEACH.—Cinema, for Holbeach Amusements, Ltd.; R. W. Chambers, secretary, 7, South Brink, Wisbech.

HORNCHURCH.—Senior school (£18,756), for Essex E.C.; J. Stuart, architect, Chelmsford.

HUDDERSFIELD.—Clinic, for the T.C.; borough architect, 26, Ramsden Street.

HULL.—Senior school (440 places), Dansom Street; St. Mary's Catholic School managers. Blocks of flats, Madeley Street (£56,000); city engineer. Extension (480 places), Eastfield Road School. Extensions, Guildhall (£8,500); city architect.

HYDE (Ches.).—Billiards hall and shops, Borough Arcade, for W. Stansfield; W. A. Dew, architect, Market Chambers.

ISLEWORTH.—Houses (89), Hogarth Gardens and Carrington Avenue, Hounslow; P. Chase Gardener & Co., architects. Factory, Syon Lane; J. Monro & Son.

KILMARNOCK.—Two schools for advanced division centres (£34,750 each); clerk of works, Ayrshire Education Authority, Ayr.

LEIGH (Lancs.).—Schools; director of education.

LEYLAND (Lancs.).—Bank, Hough Lane, for Preston Savings Bank; A. C. M. Lillie, architect, Dowry House, Brownedge, Bamber Bridge, near Preston.

LINCOLN.—School, St. Giles, for the City E.C.; W. G. Watkins, architect, Silver Street (returnable deposit of £2 2s.).

LIVERPOOL.—Extension of Walker Art Gallery. Housing scheme, Fazackerley Hall and Knotty Ash estates; land steward and surveyor, Municipal Buildings, Dale Street.

LONDON (Leyton, E.).—Public wash-houses, for the T.C.; borough engineer.

(East Ham, E.).—Extension of Wesleyan Churches (£26,000); secretary, East Ham Wesleyan Mission Circuit.

(Blackfriars, E.C.).—Extensions, School of Printing, Broadwall; L.C.C. architect.

(Stamford Hill, N.).—Tenements (5½ acres); L.C.C. architect.

(Peckham, S.E.).—Buildings site in Rye Lane, Elm Grove and South Grove; North, Robin & Wilsdon.

(Bermondsey, S.E.).—Re-housing scheme, Pages Walk; borough engineer.

(Southwark, S.E.).—Building, Comus Place; H. Dicksee, 22, Portman Street, W.1.

(Lewisham, S.E.).—Houses (120), L.C.C. Downham estate; J. G. Stephenson. Houses (82), Selworth Road; Walter Hall & Sons, Ltd. Flats (60), Winchfield Road; borough engineer. School, Moorside Road; J. N. P. Conlan.

(Wimbledon, S.W.).—Five shops and flats, Coombe Lane; E. G. W. Souster. Telephone exchange, Kingston Road; H.M. Office of Works.

MANCHESTER.—Additions Carborundum, Ltd., Trafford Park; C. Heathcote & Sons, 53, King Street.

NORTHUMBERLAND.—Schools, Ashington (£88,000), Alnwick (£23,000), Bedlington (£54,000), Earlsdon (£38,000), Gosforth (£33,500), Hexham (£22,500), and Whitley Bay (£42,000); C. Williams, secretary, Northumberland E.C., The Moothall, Newcastle-on-Tyne.

NORTON.—Housing scheme (25 acres); Stoke city engineer.

OLDHAM.—Extensions to Nurses' home, Royal Infirmary; the governors.

OXFORD.—Reconstruction, Wolvercote paper mills; Cannon and Clapperton.

PETERBOROUGH.—Reconstruction of Theatre Royal and Empire, Broadway, for J. A. Campbell, Grantham.

RENFREWSHIRE.—Sanatorium for District Committee (£100,000); W. Fairweather, chairman of the committee, Newton Mearns.

ROCHESTER.—Houses (40) and flats (40), for the T.C.; city surveyor.

ROCHFORD.—Central school for Essex E.C.; director of education, Chelmsford.

ROMFORD.—Intermediate school (£28,828), by direct labour, for Essex E.C.; J. Stuart, county architect, Chelmsford.

ROTHWELL.—Conservative club (£5,375); Col. John Brown, architect, Northampton.

SALFORD.—Schools, Lower Kersal and on Broughton Town Hall site; R. S. Martin, secretary to the education committee.

STOKE-ON-TRENT.—Housing scheme, Carmountside estate; city engineer.

STRANRAER.—Housing scheme (44), Bowling Green Road; burgh surveyor.

STREET (Somerset).—Re-erection of Goss Mills, for Phelps and Son, Glastonbury.

STRETFORD.—Brass foundry, Trafford Park; Royce, Ltd.

SWINDON.—School, Pinehurst, for the Borough E.C.; secretary, 22, Regent Circus (returnable deposit of £1).

VANGE (Essex).—Re-erection of sawmills, for Churchill, Johnson, Ltd. (£23,000).

WALSALL.—Houses (50), Forest estate; B. Denning.

WALTON-ON-THAMES.—Church, hall and Sunday schools, Hersham Road, for the Presbyterian trustees; secretary.

WEST HARTLEPOOL.—Re-erection of drapery stores, for D. Hill, Carter & Co. (£30,000).

YORK.—Depôt, Castle Mills wharf; Shell-Mex, Ltd.